To exploit the full potential of dairy sector, a computerized record management system dairysoft was developed. Visual Basis 6.0 was used as front end while MSAccess 97 was utilized as back end for the software. The menu base dairysoft was provided with facilities for obtaining necessary reports along with separate data entry options.

1. Entry number
2. Author(s)
3. Title in English
4. Source
5. Keywords
6. Organisation where work was carried out
A50 AGRICULTURAL RESEARCH

1. Balakrishnan, P.C.; College of Agriculture, Padnekkad (India). Coconut Research Highlights in Kerala Agricultural University. Indian Coconut Journal (India). (Feb 2011) v.73(10) p.2-9 KEYWORDS: AGRICULTURAL DEVELOPMENT. RESEARCH.


6. Thomas, Mathew M.; Coconut Developement Board, Kochi (India). Baby, P.O.; Coconut Developement Board, Kochi (India). Coconut Oil, rolling back to its premium position. Indian Coconut Journal (India). (Apr 2011) v.73(12) p.2-10 KEYWORDS: COCONUT OIL.

7. Anithakumari, P.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Lekha, G.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Gender participation and training need analysis in coconut cultivation. Indian Coconut Journal (India). (May 2011) v.74(01) p.23-29 KEYWORDS: TRAINING. CULTIVATION.

C20 Extension

Utilization pattern of four mass media viz., newspaper, magazine, radio, and television was studied among 126 farmers from 11 randomly selected villages of community development block Kannauj district, Uttar Pradesh. Out of four mass media, radio was most popular medium for agricultural information among farmers. Inability to read, inability to subscribe, lack of time, poor supply of electricity and adverse affect on children were the major factors responsible for less utilization of mass media by the farmers.


The scientific messages related to health or various aspects can be transmitted through communication media among the rural women. Though this is an era of Information and Communication Technology but still women being a weaker sex suffer from a lot of health related problems due to lack of information media. Among all these media, it is difficult to say which media is most effective among rural women for nutrition education. Present investigation is an attempt to give scientific information related to health effectively among rural women through media-mix in Rudrapur block of Uttarakhand. Booklet plus Power point presentation was used as media mix for communicating message among rural women. Interview schedule was used for data collection. The findings suggested that knowledge was increased through media-mix.

C30 Documentation and Information


This paper examines 369 articles published in the Journal, Pantnagar Journal of Research, from the year 2003-2008. This paper analyses the year-wise distribution of articles, physical growth of volumes, references cited total, national and international, average length of papers, authorship pattern, degree of collaboration, illustrations and tables included, articles with/without abstracts, college & department-wise contributions of the university, and other states and countries.

Oil palm and cocoa are important plantation crops and require bioinformatics tools to hasten the research output and aid in crop improvement programmes. The current work was undertaken to assign putative function to available Expressed Sequence Tags (EST’s) of oil palm and cocoa. Annotated EST’s of cocoa and oil palm were developed into searchable database. EST’s of oil palm and cocoa were first retrieved from dbEST. FASTA formatted EST sequences were converted into countigs by running in CAP3. The countigs sequences were run in BLAST tool and their putative functions were predicted based on homology. A database of annotated EST’s was developed using MySQL and PHP programs. In this database, EST’s of cocoa and oil palm, BLAST results and gene information were stored as different tables. The database homepage contains six menus namely 'Home', 'About database', 'Tool', 'Useful links', 'Site map' and 'Contact us'. The same page contains annotated gene information for cocoa and oil palm separately. For browsing the annotated EST’s of cocoa and oilpalm, separate text boxes are provided such as 'EST’s', 'blast results' and 'gene information'. The text box 'EST’s' of oil palm has links to six different tables which stores information about six different tissues and cocoa contains seven different tables, which stores information about seven different tissues. The 'gene information' contains the 'countig number', 'similarities found in each organism', 'accession number', 'structure accession number' and 'gene function'. The cocoa and oil palm putative gene database - COPGENE is hosted at CPCRI bioinformatics website (www.bioinfcpcri.org).

E10 Agricultural Economics and Policies


The role of credit is that of giving a push to the development process. In Indian perspective the economic development centres around its agricultural development which at present stage of economy is possible mainly through increased land productivity via adoption of improved agricultural technology and adequate infrastructural facilities. The findings show that flow of credit for infrastructural facilities and also credit deposit ratio is low in Kumaon region.


The study aims to find out employment and income in agricultural vis-a-vis non-agricultural sector in district Faizabad of Uttar Pradesh. The data pertained to the agricultural year 2000-01. The study revealed that the generation of employment days were
found increasing with the increase in the size of farm in both the area of sugar factories. Study shows that total employment was 980 man days/farm/annum, out of which 86.94 per cent and 13.03 per cent was contributed by agricultural and non-agricultural sector in command area. In out side area total employment is 1101 man days/farm/ annum, out of which 88.13 per cent and 11.87 per cent is shared by agricultural and non-agricultural sector. Total per farm income was higher i.e. Rs. 60334.25 in command area than Rs. 44998.20 in out side area, thus obviously benefits the impact of sugar factories on employment and income of sugarcane growers particularly crops including sugarcane as well as agricultural sector in the study area.

14. Anithakumari, P.; Central Plantation Crops Research Institute, Regional Station, Kayangulam (India). Rajeev, M.S.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. George, Jissy; Central Plantation Crops Research Institute, Kayangulam (India)Regional Station. Improving income from coconut cultivation through farm level value addition - An analysis. Journal of Plantation Crops (India). (Apr 2011) v.39(1) p.131-136 KEYWORDS: COFFEE. PRICES.

The study was conducted during 2009-10 with the objectives to analyze the profile of farm level processors, coconut value addition, constraints faced by them and offer suggestions to farmers adopting minimal processing, direct marketing of tender nuts, copra making, coconut oil/virgin coconut oil, soap and food products. It was found that 63.3 % of the respondents were of middle age group, literate, experienced in coconut value addition for less than 8 years; low income group and 80% of them were women. Further the entrepreneurship behavior of the respondents were found to be positively and significantly correlated with their credit availed, annual income and investment made. The need for reorientation of training curricula in terms of project preparation techniques, communication/marketing skills etc., is emanated from the study. The value addition obtained per nut was found to vary from Rs. 0.5 to 15 depending on the products. The constraints and suggestions for improving farm level value addition activities are also furnished as perceived by the respondent farmers. The study showed that there is tremendous potential for farm level value addition for utilizing the marketable surplus locally and the benefits to be mutually shared by the coconut growers, with further technology and developmental support.


An attempt was made in this study to analyze the Indian coffee prices and to identify the factors affecting the Indian coffee prices. For the analysis of Indian coffee prices, the period of study was divided into two periods viz., before deregulation of coffee trade (1980-1991) and after deregulation of coffee trade (1992-2007) as deregulation of coffee trade was a major event, which brought a major change in Indian coffee trade. Analysis showed that the instability in prices has increased during the post deregulation period owing to opening up of Indian coffee market to world market. In terms of real prices, the growth was positive during the post deregulation period. During the post deregulation period, the world coffee prices were found to have a significant impact on Indian coffee prices both in Arabica
and Robusta coffee. The impact of Indian production and consumption on Indian coffee prices was found not significant.


E11 Land Economics and Policies


Field investigations were carried out on arecanut based high density multi-species cropping system at Central Plantation Crops Research Institute, Research Centre, Kahikuchi, Guwahati from 1998 to 2008 to find out productivity and economics of the system. Arecanut, banana, citrus and black pepper crops were tried in two models with full, 2/3rd and 1/3rd of recommended fertilizer levels along with recycling organic biomass in the form of compost. The results on yield of different crops indicated that there was increase in the yield of main crop and component crops over the years. Yield of arecanut, citrus, pepper were higher at 2/3rd of recommended level of fertilizer coupled with organic biomass recycling in the form of compost. Banana yield was higher at full dose of recommended fertilizer. The major share of the production cost was towards labour (55 to 65%) followed by fertilizers (30 to 40%). The employment generated in the system was 450-475 man days compared to 250-275 man days in arecanut monocrop. The net income and B:C ratio were higher under 2/3rd of recommended fertiliser level compared to full dose and 1/3rd of recommended level of fertiliser.

of Plantation Crops (India). (Aug 2011) v.39(2) p.325-329 KEYWORDS: CLIMATE. CASHEWS. EVALUATION. LAND USE.

E14  Development Economics And Policies

30. Mathew, Thomas M.; Coconut Development Board, Kochi (India). Thirty years of triumph and tribulations in integrated of coconut industry in India. Indian Coconut Journal (India). (Jan 2011) v.73(9) p.14-24 KEYWORDS: DEVELOPMENT PLANS. CULTIVATION.


32. Jayashree, A.; Coconut Development Board, Kochi (India). Opportunities for availing assistance for coconut processing units under TMOC. Indian Coconut Journal (India). (Nov 2011) v. 74(07) p. 27-28 KEYWORDS: PROCESSING. POSTHARVEST CONTROL.

E16  Production Economics


The research work of the Oil Palm improvement in India was started with selections from dura palms planted at Oil Research Station at Thodupuzha, Kerala during 1961. Initially, the performance of the population was assessed on the basis of Fresh Fruit Bunch (FFB) yield and number of bunches for nine years (1974-82). Limited number of palms were exploited for hybridization and population improvement. Selected palms were utilized for hybridization and production of hybrids. Although this population is widely utilized for seed production and genetic improvement, there was no information about its phenotypic variations especially for fruit quality components. A total of 341 dura palms of Thodupuzha materials were assessed for different fruit and seed characteristics. Fruit form analysis revealed that seven palms (2%) are teneras out of 341 palms and rest of the palms are duras. The percentage of co-efficient of variation was high for shell weight followed by kernel weight and lowest variation was recorded for percentage of mesocarp and kernel oil per fruit. This study also unearthed potentiality of unexploited dura palms (US356 US225, US147, US239, US380, US297, S285 and US375) mainly on the basis of mesocarp content and oil per fruit (84%). Promising palms could be effectively utilised for introgression into the current breeding programme.

34. Radhakrishnan, V.V.; University of Calicut, Kozhikode (India). Dept. of Botany. Kuruvilla, K.M.; Indian Cardamom Research Institute, Myladumpara (India).


E20 Organization, Administration and Management of Agricultural Enterprises or Farms


An ICAR adhoc scheme on 'Possible Diversifications and Restructuring of Coconut based Homesteads' was implemented in the six agro-ecosystems of Central zone of Kerala covering three districts namely Palakkad, Thirssur and Ernakulam with the holistic approach in coconut based homesteads from 2005 to 2008 by the participation of all the stakeholders. A comparative index namely Sustainability Development Index was developed for the study, which contained specific indices for economic, social, ecological sustainability, productivity, stability and equity dimensions. After three years of interventions, Sustainability Development Index was found to be the highest at High Elevation- Medium Rainfall (HEMR) situation (Kizhakkenchery) with 41.92. Economic sustainability (56.40) was the highest among all the dimensions because of the visibility of enhanced economic returns and increased employment opportunities. Ecological sustainability and stability were the two dimensions which contributed less for the Sustainability Development Index of the selected homesteads. It was concluded that the interventions on diversifications of coconut based homesteads indicated sustainability.


E21 Agro-industry

**E40 Cooperatives**

41. Sebastian, K. S.; Coconut Development Board, Kochi (India). What is a CPS. Indian Coconut Journal (India). (Aug 2011) v.74(04) p.23 KEYWORDS: COOPERATIVE ACTIVITIES. FARMERS.

**E70 Trade, Marketing And Distribution**


The attractiveness of scheme, feedback of farmers regarding performance of the brand in the previous year, and numerous other factors together play a significant role in influencing the decision making process of any retailer. These factors assume prime importance when the retailers get exposed a sales promotion scheme, which lures them into betting their money in advance in a particular product. The Pioneer Hi – Bred International Seeds had launched such a scheme in Eastern Uttar Pradesh and had termed it as Advance Booking Scheme. Some other important factors and established facts of trade counterbalance the risk being taken, by the way of providing the retailers a safeguard against shortage of stock, which is costlier and might results into loosing the customers and business to competitors. This helps the retailers in retaining the existing customers, as well as reputation of their respective counters. Thus, the benefits offered by such schemes cannot be overlooked. Of the many innovative ideas, some of the most recent are ensuring the reach of company personnel to every nook-and-corner of the villages and making the availability of Advance Booking Scheme (ABS) brochures in the most common used language of North India, Hindi which have definitely proved its edge in the market owing to which one of the territories of Uttar Pradesh, covering the districts of Bahraich, Gonda, Shravasti and Balrampur recorded a landmark booking. PHI Seeds Sales and Marketing teams continuously keep a watch and come up with new below-the-line (BTL) activities for giving focused attention to the prevailing market conditions. Launching Free Good Scheme (FGO) as an incentive to the ABS is one such BTL schemes and has been quite successful in its attempt of extracting majority of funds from the market. The recent study supports the fact that there is a gradual shift in the proportion of farmers seeking a brand by name as compared to those following the retailers advice owing to increasing level of extension activities from company’s side which in turn leads to enhancement of awareness level amongst the farmers. Apart from these key issues, the biggest threat to the retailers at this point of time is the much talked about subsidy regarding hybrid paddy seeds. The season for
paddy seeds sale may vary from a week to a fortnight and if the subsidy be offered in the accurate time frame, retailer’s position would really be threatened.


KEYWORDS: MARKETING. ANIMAL PRODUCTS. SELF HELP. WEST BENGAL.

The Swarnjayanti Gram Swarojgar Yojana (SGSY) guide lines had a provision and mandate of forming number of Self Help Groups (SHGs) and then provide the self employment opportunities to all the members of the groups. The guidelines of SGSY concentrated more on the inputs, rather than the outputs, and their marketing. In such a scenario the study was conducted with the aim of exploring and profiling the marketing practices adopted by these Self Help Groups for marketing their livestock products, so as to generate revenue. The data was collected with the help of a structured questionnaires was used as an instrument for data collection followed by application of analytical tools like factor analysis, cross tabulation and chi–square test to draw inferences. Majority of the SHGs in the area of study have been found practicing mixed type of farming related to livestock and animal husbandry. This type of farming is fetching them higher returns as compared to other activities like dairy, poultry, goat rearing etc. The problems being encountered by SHG members were found to be mainly problems of distress sale, problem of transportation of products to specific markets and problems generated due to lack of market information. The volume of production being on the lower side and that too getting dented by the problems related to transportation were turning strong enough to force the SHG members to sell their products at lower prices and that too, through involvement of intermediaries. Distress-sale was also forced because of disease conditions, less bargaining power and false market information. The profit margins of the SHG members were getting affected by the costs involved in rearing unproductive animals also. In some cases Rhode Island Rhode (RIR) breed of poultry which these SHG members were rearing, was not having acceptance of the local customers. Improved transportation facility to specific local markets can enhance the profitability of the SHG members.


KEYWORDS: TECHNOLOGY. TEA.


KEYWORDS: COCONUTS. AGROINDUSTRIAL SECTOR.

E71 International Trade

E73 Consumer Economics


49. Nair, Deepthi S.; Coconut Development Board, Kochi (India). Prospects of ASEAN and FTAs for the Indian economy. Indian Coconut Journal (India). (Oct 2011) v.74(06) p.16-18 KEYWORDS: HORTICULTURE. TRADE LIBERALIZATION.


52. Ragavarao, K.S.M.S.; Central Food Technological Research Institute, Mysore (India). Rastogi, Navin K.; Central Food Technological Research Institute, Mysore (India). Hrishikesh, A.; Central Food Technological Research Institute, Mysore (India). Value added products from coconut timber. Indian Coconut Journal (India). (Nov 2011) v.74(07) p.11-14 KEYWORDS: TIMBER TREES. HARDWOOD.


E80 Home Economics, Industries and Crafts

A number of resources are available in the surroundings of the farm families. The families are not aware of their appropriate use. Identification of such on-farm and off-farm waste and their proper utilization is a profitable venture that needs to be promoted among rural women. Building capacity of rural women in efficient utilization of farm waste as the economic activity will bring about improvement in their quality of life. Training on mushroom cultivation and biogas production was organized in villages. Home visits by biogas experts were also organized to solve day-to-day problem related to gas production. Results of the study show that there was significant gain in the knowledge of the respondents as a result of the trainings. There is need to mobilize rural people to take up these activities at household level to provide livelihood security.


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A dietary survey was conducted to study the diet and nutrient intake of Buxa adolescent girls residing in Bazpur block in distt. U.S. Nagar of Uttarakhand state. In total 85 adolescent girls were taken. Diet survey was conducted for three consecutive days using 24 hour recall method. Nutrient content in the food items consumed was worked out by using the nutritive values in different food items. Buxa adolescent girls had two meals per day and the left over food of the previous day was taken in the morning. Cereals-rice and wheat were the main ingredients of the food and these provided the required quantity of energy. The quantity of pulses, vegetables, fats and oils and milk consumed was grossly inadequate. Practically there were no food items of animal sources – milk, meat, egg, and fish in their diet. In terms of nutrients, the diet of Buxa tribal women had nearly adequate calories, protein, fat, iron, thiamine, and niacin. However, the diet was grossly inadequate in Calcium, β Carotene and riboflavin. However, the quantity of protein was as per requirement, but
this protein was of poor quality. Similar was the case with iron where the quantity was adequate, which are not considered as good source of iron. The study brings out the fact that the diet of Buxa women was imbalanced and of low quality and deficient in certain vital nutrients.

57. Gupta, Sakshi; CSKHPKV, Palampur (India). Department of Food Science and Nutrition. Sood, Sangeeta; CSKHPKV, Palampur (India). Department of Food Science and Nutrition. Singh, Nageshwar; CSKHPKV, Palampur (India). Department of Chemistry and Biochemistry. Gupta, Minakshi; CSKHPKV, Palampur (India). Department of Chemistry and Biochemistry. Effect of Neelkanthi (Ajuga bracteosa) and Plakhar (Ficus lacor) on the energy expenditure of diabetic subjects. Pantnagar Journal of Research (India). (Jul-Dec 2008) v.6(2) p.286-290 KEYWORDS: AJUGA. FICUS. DIABETES. ENERGY EXPENDITURE. CHOLESTEROL. BLOOD SUGAR.

The present investigation was carried out to determine the efficacy of two medicinal plant species i.e Neelkanthi (Ajuga bracteosa) and Plakhar( Ficus lacor) on energy expenditure of diabetic subjects. Energy expenditure was measured by using Wireless Heart Rate Monitor and Indian Council of Medical Research (ICMR) prediction equation. Study revealed that all the treatments and sub treatments resulted in the decrease of energy expenditure. Neelkanthi had reduced the energy expenditure to a lower level in comparison to Plakhar. Presence of fibre i.e. Neutral Detergent Fibre(NDF) and Acid Detergent Fibre(ADF) and antioxidants i.e. fα-carotene and vitamin-C stimulates the action of insulin and thus reduces the blood sugar level and ultimately reduces weight and decreases energy expenditure through reduction in heart beats/minutes and decrease the rate of gluconeogensis to maintain carbohydrate metabolism.


The study revealed that respondents belonged to 20-30 years of age, were matric, and had training in embroidery for two years. The majority of respondents had a monthly personal income up to Rs. 4000-6000 and family income Rs. 4000-10,000. The average personal and family income was Rs. 4940 and Rs. 6555 with a range from Rs. 2000-8000 and Rs. 3000-16,000 respectively. The different problems faced by the workers were related to nonavailability of raw material, financial problems, marketing problems, and personal problems. Problems related to raw material were inferior quality material, non-availability of raw material in desired colour etc. Major financial problems were less profit and irregular income. They used to face marketing problems due to fast changing trends and no fixed place for selling embroidered articles. Respondents faced various personal problems like busy schedule, effect on general health, mentally challenging work etc.

59. Bora, Preeti; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Foods and Nutrition. Kulshrestha, Kalpana; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Foods and Nutrition. Chemical and physicochemical evaluation of green gram husk. Pantnagar Journal of
Dietary fiber is steadily gaining importance in human diet. Beneficial effects of dietary fiber have been attributed to its role in modifying some of the physiological activities in the body. Dietary fiber is generally considered as unavailable carbohydrate and used as mild laxative. It is also useful in the prevention and treatment of chronic diseases such as hypertension, coronary heart diseases, obesity, diabetes and certain cancers. Pulse husk is a major by-product of dal mills which is rich in fiber, basically used as ruminant feed but could be exploited for benefit of human being. Its nutritional significance is less known, in view of this, the present study was undertaken to evaluate green gram husk for its chemical and physicochemical characteristics. The result of the present study revealed that green gram husk is rich in crude and dietary fiber. The dietary fiber being 54 per cent of the husk is almost insoluble dietary fiber which is suitable for gastrointestinal health and relieving constipation.
that women's participation and responsibility was more in livestock management activities in comparison to farm and homestead gardening activities. Rural men had more access and control over farm related resources. In livestock management and household related resources both rural men and women had partial access and control over majority of the activities.

**F01**  
**Crop Husbandry**


A field experiment was conducted to study the various climatological parameters taken under the environmental controlled and naturally ventilated polyhouse during March to July 2006. Both the polyhouses were planted with capsicum (Capsicum annuum L.). The climatic parameters such as temperature, relative humidity, and solar intensity were measured at 0900 hr, 1200 hr, and 1600 hr. The comparisons were also made with the ambient conditions prevailing in outside open field. The results reveal that the temperature was high at time 1200 hr followed by 1600 hr than 0900 hr. The temperature was observed higher in naturally ventilated polyhouse followed by the open field condition than environmental controlled polyhouse. Relative humidity was high in environmental controlled polyhouse followed by naturally ventilated polyhouse than open field condition; also, relative humidity was high at 0900 hr followed by 1600 hr than 1200 hr. The solar radiation was observed high in open field followed by environmental controlled polyhouse than naturally ventilated polyhouse, also observed high at 1200 hr followed by 1600 hr than 0900 hr.


The grain yield of rice, on an average, in all the three rice establishment methods was similar (5693, 5689 and 5684 kg ha⁻¹ in DSR, WSR and TPR, respectively) when weeds were controlled using herbicide followed by two hand weedicings. Variation in crop growth parameters were observed, with more number of panicle per unit area in WSR followed by DSR and TPR. The number of grains per panicle was highest in TPR followed by DSR and WSR. Less panicle number in the transplanted rice crop was compensated by larger panicle and more number of grains per panicle and vice-versa in case of DSR and WSR. Root number
when expressed in percentage in different layers, TPR had highest percentage of roots in 0-10 cm followed by DSR and WSR. In 10-20 cm, DSR had higher number of roots followed by TPR and WSR. At rice harvest in puddled fields the bulk density in 0-7 cm and 12-19 cm soil layer was higher and infiltration rate was lower as compared to unpuddled field.


The present study, consisting of six intensities of pruning viz. harvesting of fruits only (T1), cutting the bearing shoot at its origin (T2), cutting the bearing shoots 20 cm below the panicle (T3), 40 cm below the panicle (T4), 60 cm below the panicle (T5), and 80 cm below the panicle (T6) was conducted to find out the suitable level of shoot pruning for maximum yield of quality fruits on 16 years old litchi trees. Results obtained indicated that pruning of the bearing shoot 40 cm below the panicle significantly increased the fruit yield, fruit weight and pulp recovery of litchi. Non-significant differences were observed in case of fruit drop, fruit cracking and size of seed due to various pruning intensities.

65. Paraye, P.M; Indira Gandhi Agricultural University, Bhatapara (India). KVK. Chaubey, A.K.; Indira Gandhi Agricultural University, Bhatapara (India). KVK. Effect of nutrient management and plant density on growth, yield attributes and yield of Sunflower (Helianthus annuus), Pantnagar Journal of Research (India). (Jul-Dec 2010) v.8(2) p.148-150 KEYWORDS: NUTRIENTS. PLANT POPULATION. HELIANTHUS ANNUUS. YIELD INCREASES.

A field experiment was conducted during winter season of 2006 at Regional Agricultural Research Station, IGKVV, Raigarh (C.G.), to study the effect of fertility and plant density on growth, yield attributes and yield of sunflower under sandy clay loam soils. The experiment was laid out in split-plot design with 3 replications, having 3 planting density (30 x 20 cm) S1, (40 x 20 cm) S2 & (50 x 20 cm) S3 as main plot treatments and 4 nutrient management including (Control: no fertilizer) F0, (40:32:30 Kg N. P2O5 & K2O ha-1) F1, (80:65:60 N, P2O5 & K2O Kg ha-1 RDF) F 2 & (120:97:90 Kg N. P2O5 & K2O ha-1) RDF F 3 as sub plot treatments. Closer plant density S1 showed the highest seed yield of sunflower (9.26 q ha-1) which was significantly higher over wider plant density S2 & S3. Maximum plant height (41.9 cm) was obtained with highest fertility level F3 however, there was non significant difference in plant height either in lower fertility level F1 or in recommended dose of fertility level F2 but all the fertility levels were significant over control F0. Maximum value of head diameter of sunflower (40.1 cm) was obtained with highest fertility level F3 which was significantly superior over F0, F1 and F 2 fertility levels. Maximum value of stover yield (41.7 q ha-1) and seed yield (10.2 q ha-1) was obtained with highest fertility level F3 which was statistically similar with recommended fertility level F2 but these were significant over control F0 and lower fertility level F1.


KEYWORDS: GIRDLING. LITCHI. LITCHI CHINENSIS. LYCHEES. YIELD INCREASES.

The present investigation was carried out at Horticulture Research Centre of G.B.P.U.A&T., Pantnagar to study the effect of girdling on yield and quality of litchi cv. Rose Scented. All the plants which were subjected to different level of girdling have more fruit set, fruit retention, yield and quality of fruits. However, girdling of main trunk + 50% of primary branches in which 3 mm wide and 3 mm deep ring of bark was removed found effective for obtaining maximum fruit yield (90 kg/tone) and good quality fruit (TSS–19° Brix, acidity-0.62%, ascorbic acid- 29.86 mg/100 g pulp, total sugar-13.50% and TSS : acid ratio– 30.93). Improvement in fruit yield and quality of litchi trees may be due to rapid translocation of photosynthates and minerals from other part of the plants to developing fruits and reduced flow of carbohydrates to the roots.


KEYWORDS: GAMMA IRRADIATION. GLADIOLUS. FLORICULTURE. MUTAGENS.

The demand of Gladiolus is increasing day by day, therefore it needs attention towards genetic improvement of gladiolus. It is known that frequency and spectrum of mutations differ somewhat depending upon the mutagen used and the dose applied. The present study was conducted to see the effect of gamma irradiation on various growth and flowering attributes on 20 varieties of gladiolus. It was found that lower doses i.e. 0.5 and 1.5 Kr is effective in improving some important vegetative and floral parameters. Four mutants were obtained.


KEYWORDS: CROP MANAGEMENT. CAMELLIA SINENSIS. PLANTATIONS. EVAPOTRANSPIRATION. WATER REQUIREMENTS.

The experiments were conducted at five locations during 2005-06 from March to May for the in-situ determination of crop coefficient in Kausani tea plantation of Uttarakhand. Reference evapotranspiration and actual crop evapotranspiration values were used to determine the crop coefficient. Actual crop evapotranspiration were determined using water balance approach. The average values of crop coefficients were 0.73, 0.94 and 0.96 during March, April and May respectively with standard deviation of 0.0386, 0.032 and 0.0354.


F02 Plant Propagation


The investigation was conducted during the year 2005-2007 to standardize a protocol for production of strawberry plants. The establishment MS medium supplemented with BAP (0.5 mg/l) and kinetin (0.5 mg/l) was found best for culture survival (88.92%), earlier days to shoot emergence (9.81 days), shoot elongation (11.19 days) and number of shoots per explant (5.73). Different combinations of growth regulators BAP, IBA, kinetin, and GA3 were tried for further shoot multiplication. In BAP, IBA and GA3 combination MS medium supplemented with BAP (0.5 mg/l) and IBA (0.5 mg/l) and GA3 (1.0 mg/l) resulted maximum shoot length (10.50 cm) while, maximum number of shoots (14.50) per explant was found on MS medium supplemented with BAP (0.5 mg/l) and IBA (0.5 mg/l). In BAP, kinetin and GA3 combination MS medium supplemented with BAP (0.5 mg/l), kinetin (0.5 mg/l) and GA3 (2.0 mg/l) was resulted maximum shoot length (4.60 cm), number of shoots (4.44), number of leaves (10.3) and number of fragments (3.71) per explant.

F03 Seed Production and Processing

71. Gopalakrishnan, Ramani; Coconut Developement Board, Kochi (India). The Demonstration cum-seed production for coconut, Neriamangalam, Kerala. Indian Coconut Journal (India). (June & Jul 2011) v. 74(2 & 3) p. 21-30 KEYWORDS: PLANTING. SEED TECHNOLOGY.


73. Singh, M.K.; DSP Farm, Mandya (India). Demonstration cum seed production farm for coconut, Mandya- A model farm. Indian Coconut Journal (India). (Aug 2011) v. 74(04) p.31-32 KEYWORDS: SEED TECHNOLOGY. IRRIGATION.

F04 Fertilizing

Field experiment was conducted to find out the effect of organic manure and mulching on growth characters, yield and quality of guava. Integration of organic manures with mulching showed good effect on crop. Combination of 15 kg compost + 6 kg soybean mulch/tree/year found best among all other treatments with highest yield (76.82 kg/tree).


A laboratory experiment was conducted to study the effect of different combinations of organic and inorganic sources of nutrients on mineralization of organic carbon and nitrogen with treatments viz. control, starter nitrogen, wheat straw, FYM, wheat straw +N, FYM+N, rice straw and rice straw +N, three replications of each treatment. Rice straw, wheat straw and FYM are applied at the rate of 5t /ha, 5t /ha, and 15 t/ha respectively with or without starter dose of nitrogen (for straw 20 kg N/ha and for FYM 90 kg N/ha). These treatments were incubated for 90 days. The mineralization of carbon and nitrogen were measured quantitatively following alkali trap method and incubation method respectively. The amount of carbon mineralized from the soil was maximum with the rice straw. Starter nitrogen treated soil showed highest amount of nitrogen mineralized at each date of observation.


A field experiment was conducted during Rabi seasons of 2003-04 and 2004-05 to study the effect of nitrogen and sulphur application on yield attributes and yield of wheat (PBW-343). Two split application of nitrogen( 1/3 basal+2/3 at first node) resulted higher number of spikes/m2, number of fertile spikelets per spike, grain weight per spike and grain yield as compared to three split application (1/2 basal+ 1/4 at tillering+1/4 at milk stage). Application of sulphur with Cosavat25 kg/ha was found optimum for obtaining significantly higher number of spike/m2, grain weight per spike and grain yield over control.


An experiment was conducted during 2003-04 and 2004-05 to evaluate macro-nutrients combination on its availability, uptake, physiological efficiency indices (PEI), fertility balance and apparent nutrients recovery of NPK on soybean. The availability and uptake of N, P was significantly higher in T12 (N40P80K20). The PEI of N and K was maximum in T1 (control).


The response of yellow sarson to the selected combinations of 4 levels of each fertilizer N, P, K and 3 levels of FYM with simultaneous variations in initially available soil forms of these nutrients was studied as per technical programme of Soil Test Crop Response (STCR) in an Aquic Hapludoll of Crop Research Centre of G.B.P.U.A & T, Pantnagar Uttarakhand in year 2006-07. The straw and grain yield and plant and soil analysis data were utilized to formulate equations each for inorganic and organic mode connecting the fertilizer doses with varying yield targets at different fertility levels. The validity of the equations has been tested in the verification trial in the next year. It was found that fertilizer application based on yield target gave higher yields, net benefit and B/C ratio over the farmer’s practice and general fertilizer recommendation.

80. Singh, Sobaran; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Soil Science. Sati, Avtari; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Soil Science. Mishra, Peeyush; G.B. Pant

Investigations were carried out to study the impact of inorganic fertilizer substitutions by vermicompost on productivity of coconut during 2001 to 2009 at CPCRI, RS, Vittal in a 22 year old coconut garden under laterite soil. The treatments viz. recommended inorganic fertilizer (500g N, 320g P2O5 and 1200g K2O palm/year), 25% of N in the form of Vermicompost (VC) (9.6 kg/palm)+75% of NPK, 50% N in the form of Vermicompost VC (19.2 kg/palm)+50% of NPK, 75% N in the form of Vermicompost (VC) (28.8 kg/palm)+25% NPK and 100% N in the form of VC alone (38.5 kg/palm) were imposed in randomized block design. Five year pooled nut yield data indicated that, application of vermicompost in combination with inorganic fertilizer either at 25% Vermicompost (VC) + 75% NPK (65 nuts) or 50% VC + 50% NPK (63.2 nuts) resulted in significantly higher nut yield. The copra content and oil content did not differ significantly among the treatments. However, the copra content was ranged between 182.2 g to 184.4 g/nut and oil content ranged between 64.0 to 65.8 %. Economics of different treatments indicated that, the net return obtained under 2% Vermicompost (VC) + 75% NPK and 50% VC + 50% NPK was higher (Rs. 16,673/- and Rs. 16,144/-per ha, respectively) compared to other treatments.

82. Poduval, Mini; Bidhan Chandra Krishi Viswavidyalaya, West Bengal (India) Regional Research Station. Yadukumar, N.; Directorate of Cashew Research, Puttur (India). Effect of different doses of fertilizers on different densities of cashew plantation. Journal of Plantation Crops (India). (Apr 2011) v.39(1)p.35-40 KEYWORDS: FERTILIZER APPLICATION.

Increasing pressure on land owing to diversion of orchard lands to other purposes as well as rising energy and land-costs, together with mounting demand for cashew have made it imperative to achieve higher productivity in cashew too. Therefore, maintenance of optimum population per unit area is most important for getting substantially high yield. Together with that a proper fertilizer recommendation is obviously required to maintain the population with its maximum productivity level. Thus the present study was undertaken with the objective of finding out the response of vegetatively propagated material of cashew to different doses of fertilizers at different plant densities. Considering the individual tree yield it was noticed that the plants under the density of 200 plants/ha supported the maximum yield 5.07 to 5.41 kg/tree at the age of 5years. But when the yield was calculated per unit area basis, highest yield was found with the plant density of 500 plants /ha (19.58 kg/tree) at the third harvest. Maximum Benefit : Cost ratio (2.26) was recorded with
application of fertilizer 75 kg N + 25 kg P2O5 + 25 kg K2O per ha per year under a tree density of 400 plants/ha.

F06 Irrigation


A field experiment was conducted at to study the effect of cyclic and fertigation on off-season production of capsicum (Capsicum annuum L.) under protected environment. The treatment consists of two irrigation levels (100 and 75% of water requirement) and three cycles level (One cycle per day, three cycles per day and six cycles per day) and two level of Fertigation in naturally ventilated polyhouse (NVPH) (normal and split fertigation) and only split Fertigation in environmentally controlled polyhouse (ECPH). The results revealed that the plant height was higher in NVPH where as the number of primary and secondary branches, canopy perimeter, yield, and yield attributes were higher in ECPH than NVPH. The irrigation treatment with three cycles per day under split fertigation (10.97, 10.10) has higher yield than six cycles (10.57, 9.33) and one cycle (7.59, 9.33) under split fertigation in ECPH and NVPH respectively. The water use efficiency was higher under treatment of three cycles per day with combination of 75 per cent of water requirement under split Fertigation in both polyhouse. The cyclic irrigation increased the water-use efficiency.


A field experiment was conducted during kharif season of 2005 to know the most suitable transplanting date, irrigation schedule and fertilizer dozes to get high yield of the crop. The study showed that the second transplanting at 30th June with 120 kg N ha-1 and irrigation at 3 days after disappearance of ponded water is most suitable for good yield of the Pusa Sugandha-3.

85. Mishra, A.K.; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Agrometerology. Tripathi, Padmakar; Narendra Dev University of Agriculture and Technology, Faizabad (India). Department of Agricultural Meteorology. Effect of
irrigation frequencies on yield and water use efficiency of wheat varieties. Pantnagar Journal of Research (India). (Jan-Jun 2010) v.8(1) p.1-4 KEYWORDS: IRRIGATION METHODS. IRRIGATION SCHEDULING. WATER UPTAKE. WATER USE. WHEATS. TRITICUM AESTIVUM.

Field experiment was conducted to study the effect of irrigation frequencies on yield and water use efficiency of wheat varieties during Rabi seasons of 2002-03 and 2003-04. The 12 treatment combinations comprised of four irrigation levels viz., I1 (one irrigation at CRI stage), I2 (two irrigations: one each at CRI and flowering stage), I3 (three irrigations: one each at CRI, LT and flowering stages) and I4 (four irrigations: one each at CRI + LT + LJ + ear head formation stages) along with the combination of three varieties viz., HUW-234, HD-2285 and PBW-154. Progressive increase in number of irrigations from 1 to 4 increased various yield contributing characters viz., effective tillers m\(^{-2}\), ear length, no. of grains ear\(^{-1}\) and test weight while three and four irrigations were found statistically at par with each other. The highest grain yield (40.65 q ha\(^{-1}\)) was credited to I4 that was significantly superior over I1 and I2 but non-significant with I3. Consumptive use of water increased while water use efficiency gradually decreased with increase in number of irrigations. Among the varieties tested, HUW-234 recorded significantly higher yield and yield contributing characters and was found superior over rest two varieties. On the other hand, no significant difference was found between HD-2285 and PBW-154 for most of the yield characters. Highest consumptive use of water was credited to PBW-154 resulting in lowest water use efficiency. However maximum water use efficiency among the varieties was recorded in HUW-234.


A field experiment was conducted at Horticulture Research Centre, Pattherchatta to study the response of microirrigation and fertigation on yield and quality of litchi cv. Rose Scented. Thirteen treatment combinations involving microirrigation (Bubbler) and fertigation with or without microsprinkler including control (Surface irrigaton and conventional fertilizer application) were applied for study. Data were analyzed on growth, yield and quality which revealed that the tree height and canopy spread were recorded at their maximum under bubbler discharge at 1.0 V level along with 125% level of fertigation. Maximum fruit set, fruit retention, fruit weight, fruit volume, fruit yield, ascorbic acid content with the minimum fruit cracking were recorded under treatment bubbler discharge at 1.0 V level + microsprinkler + 125% level of fertigation, while the maximum TSS was recorded under bubbler discharge at 0.75% level + microsprinkler + 125% level of fertigation. Titrable acidity was maximum under control.

87. Mathew, A.C.; Central Plantation Crops Research Institute, Kasaragod (India). Thamban, C.; Central Plantation Crops Research Institute, Kasaragod (India). Irrigation

Coconut farmers practice different irrigation methods to overcome the water stress during the non-rainy season. A study has been undertaken to evaluate the field performance of prevailing irrigation systems, drip, sprinkler and basin irrigations, installed in farmer’s field. It is evident from the study that substantial increase in yield is possible by providing irrigation to coconut. Majority of the farmers provide sufficient or more water to coconut and hence availability of water was not a limiting factor in the productivity of the palm under irrigated condition. Loss of irrigation water due to deep percolation occurred in most of the cases. Average distribution uniformity obtained by drip and sprinkler irrigations in the study is only 46%. Clogging of emitters and undulating topography are the main reasons for the poor distribution uniformity in drip irrigated plots. Clogging due to physical impurities and obstruction to the water jet due to intercrops and other vegetation are the main reasons for the poor distribution uniformity in sprinkler irrigation. In basin irrigated gardens all the farmers were doing irrigation manually and they took adequate care to distribute the applied water fairly uniformly in the whole basin. This is the reason for obtaining high distribution uniformity (90.33%) in basin irrigation. Irrigation application efficiency was less than 50% except in basin irrigation showing the improper utilization of irrigation water. In terms of volume of water, sprinkler irrigation consumed five times more water than that of drip irrigation and two times more water than that of basin irrigation in farmer’s field.

88. Jayarama; Central Coffee Research Institute, Chickmagalur (India) CRS. Hareesh, S.B.; Central Coffee Research Institute, Chickmagalur (India) CRS. Keshavayya, J.; Kuvempu University, Shankaraghatta (India). Dept. of Chemistry. Prasanna, S.M.; Central Coffee Research Institute, Chickmagalur (India). CRS. D'Souza, Maria Violet; Central Coffee Research Institute, Chickmagalur (India). CRS. Impact of nutrition mode, shade and irrigation on leaf nutrient status and yield of robusta coffee (Coffea canephora). Journal of Plantation Crops (India). (Apr 2011) v.39(1) p.167-170 KEYWORDS: IRRIGATION. SHADE.


F07 Soil Cultivation

91. D’Souza, Maria Violet; Central Coffee Research Institute, Chickmagalur (India). CRS. Prasanna, S.M.; Central Coffee Research Institute, Chickmagalur (India). CRS. Hareesh, B.S; Central Coffee Research Institute, Chickmagalur (India). CRS. Jayarama; Central Coffee Research Institute, Chickmagalur (India). CRS. Sherigara, B.S.; Kuvempu University,

Coffee growing soils receive trace metals like copper, zinc, lead and cadmium either through agro-inputs like fertilizers, urban compost, sewage sludge etc., or through plant protection chemicals like fungicides/herbicides. The extensive use of such inputs over long periods leads to accumulation of nutrient as well as toxic elements in soils. The presence of one element in excess can affect the uptake of the other and result into imbalance in supply of essential nutrients to the standing crop in that soil. Hence to understand the interaction of nutrient element like copper with another nutrient, zinc and two toxic elements, viz., lead and cadmium, batch equilibration study was taken up in coffee growing soils representing four major states of south India. The variation in adsorption pattern and sequence of affinity in binary systems was studied. The data indicated that the presence of any other element reduced the quantum of adsorption of copper in all the four soils (Balehonnur, Thandigudi, Chundale and R V Nagar) compared to that in a solitary system. The affinity sequence for the elements was Pb Cu Zn Cd in majority of the soils while that for Chundale soils was Cu Pb Zn Cd.


A field experiment was conducted at Indian Cardamom Research Institute, Spices Board, Myladumpara, Idukki district, Kerala during 2006-09 to study the response of foliar application of zinc and boron on growth, yield and its content in index leaves in small cardamom. The experiment was laid out in randomized block design with twelve treatments replicated thrice. The treatments were various levels of zinc (0.1, 0.25, 0.5, 0.75 and 0.9%) as zinc sulphate and boron (0.2, 0.4, 0.6, 0.8, 1.0 and 1.2%) as borax with a control. The zinc content in the leaves of zinc treated plants ranged from 53.79 mg kg\(^{-1}\) to 116.67 mg kg\(^{-1}\). The boron content in leaves of the boron treated plants ranged from 20.62 mg kg\(^{-1}\) to 34.37 mg kg\(^{-1}\). The DTPA extractable zinc in soil was 0.756 to 0.917 mg kg\(^{-1}\) in zinc treatments and 0.93 mg kg\(^{-1}\) in control plot. Hot water extractable boron in soil ranged between 0.90 mg kg\(^{-1}\) to 2.2 mg kg\(^{-1}\) in boron treatments and 0.850 mg kg\(^{-1}\) in control plot. Application of boron at 0.6 and 0.8% significantly improved the yield of cardamom compared to control. A significant quadratic relationship was established between yield and various levels of zinc and the quadratic curve gives the zinc optimum dose as 0.3 %. The yield attributing characters like number of panicles per clump and number of racemes per panicle were positively influenced by the foliar application of zinc and boron.

F08 Cropping Patterns and Systems

An experiment on basmati rice cv. Pusa Basmati-1 was conducted during kharif 2004 and 2005 under different combinations of organic fertilization and plant protection measures to assess the effect of different treatments on grain quality parameters. Control with recommended cultural practices was also taken to compare with organic treatments. Green manure treatments exhibited high hulling and head rice recoveries, L/B ratio, elongation ratio and amylose content (%). The alkali spreading value ranged between 6.4-7.0 indicating low gelatinization temperature requirements for all the treatments. Almost similar response to different treatments was observed in case of aroma content of rice kernel during both the years.


KEYWORDS: COCONUTS. INTERCROPPING.

A field study was conducted at Horticulture Research Station, Arsikere, Karnataka during 2006-07 to 2008-09 to identify suitable medicinal and aromatic plants for intercropping in coconut gardens of maidan tract of Karnataka. The experiment consisted of 14 medicinal and aromatic crops viz., Kalmegh (Andrographis paniculata), Makoi (Solanum nigrum), Coleus (Coleus forskohlii), Garden rue (Ruta graveolens), Lepidium (Lepidium sativum), Tulsi (Ocimum sanctum), Arrow root (Maranta arundinaceae), Kacholam (Kaemferia galanga), Cowhage (Mucuna pruriens), Roselle (Hibiscus sabdariffa), Ambrette (Abelmoschus moschatus), Citronella (Cymbopogon winteranus), Lemon grass (Cymbopogon flexuosus) and Vetiver grass (Vetiveria zizanoides). The yield of all the medicinal and aromatic crops grown as intercrop in coconut garden were reduced compared to their sole crop yields. The reduction in yield was less in lemon grass (6.4 %), tulsi (23.5 %), arrow root (23.9 %), vetiver grass (25.1 %), kalmegh (25.7 %), makoi (29.1 %), citronella (30.2 %) and garden rue (30.5 %). The nut yield of coconut was improved with intercropping of medicinal and aromatic crops. The andrographolide content in kalmegh (4.40 to 3.20 %), rutin alkaloids in garden rue (1.68 to 1.40 %) and oil content in lepidium (19.60 to 17.23 %) were significantly reduced when grown as intercrops in coconut garden as compared to sole crop. However, the forskohlin content in coeleus (0.43 to 0.61 %) and essential oil content in ambrette (0.24 to 0.29 %) were significantly increased by intercropping. In other medicinal and aromatic crops, the quality parameters were not significantly influenced by intercropping. The intercropping system of growing lemon grass under coconut recorded the highest net income (Rs. 91,561/ha) and B:C ratio (2.89) followed by garden rue (Rs. 81,865/ha and 2.79), tulsi (Rs. 77,472/ha and 2.71), kalmegh (Rs. 75,163/ha and 2.56), arrow root (Rs. 72,211/ha and 2.28) and makoi (Rs. 67,058/ha and 2.68). Hence, intercropping of lemon grass, garden rue, tulsi, kalmegh, arrow root and makoi with coconut can be recommended for maidan tract of Karnataka.
A field experiment was carried out during 2002-03 and 2003-04 to assess the extent of reductions in yield due to application of inorganic fertilizers below the recommended level and also the benefits in yield due to integrated nutrient management (INM) in mustard (Brassica juncea L.) variety Kranti. The NPK levels applied were 100%, 75% and 50% of recommended fertilizer (RF) through inorganic fertilizers alone and in combination. Significant reduction in yield and yield contributing parameters like number of branches, number of siliquae and plant height was recorded with reduction in fertility levels during both the years. Similar trend was recorded in uptake of N, P, K, S, Zn and B nutrients. Significantly highest values of plant height, number of branches, number of siliquae, and seed and oil yield were recorded with T6 where complete INM package was applied along with 100 per cent of RF followed by T12 and T18 where the same INM package was applied along with 75 and 50% of RF level. Significantly higher uptake values of N, P, K, S, Zn, and B were also recorded in these treatments.

The present study summarizes that the MPTs (forest and horticultural trees) were planted along the bund, middle and other places of agricultural lands depending upon the geographical condition, need, economics and environmental status in the existing agroforestry systems of mid hill situation of Garhwal Himalaya between 1000 to 2000m. The highest 59.09% trees were present on the bunds in agrisilviculture (AS) system followed by 51.19% on the other places in agrihorticulture (AH) system whereas the middle portion of the field was generally shared by the horticultural trees in agrihortisilviculture (AHS) system. The regeneration status was observed to be very poor in the existing agroforestry systems. The availability of trees was reported as 4.41, 3.62, 4.86 tree/100m2, sapling as 0.95, 0.85, 0.85 sapling/100m2 and seedling as 0.24, 0.26, 0.30 seedling/100m2 in the AS, AHS and AH systems respectively. The regeneration status was comparatively higher in the northern aspect compared to southern.

A field experiment was conducted during rabi season of 2005-2006 to kharif season of 2006-2007 to study the yield, nutrient composition and uptake of basmati rice in different cropping systems under organic mode. The experiment was laid out in Split Plot Design with three cropping systems, viz. C1 (Sesbania - basmati rice-wheat), C2 (Sesbania-basmati rice-chickpea) and C3 (Sesbania-basmati rice-vegetable pea) in main plots and five organic manure treatments, viz. N1 (½ Enriched compost + ½ Vermicompost), N2 (½ Neem cake + ½ Vermicompost), N3 (½ Farm yard manure + ½ Vermicompost), N4 (¼ Enriched compost + ¼ Vermicompost + ¼ Farm yard manure + ¼ Neem cake) and N5 (no manure application) in sub-plots replicated for three times. Organic manures were applied only before sowing of rabi crops and basmati rice was grown solely depending on Sesbania green manuring. The crop yielded 7.60 and 8.80 q ha-1 more in C2 (Sesbania-basmati rice-chickpea) system over C1 (Sesbania-basmati rice-wheat) system in first and second year, respectively. Uptake of nutrients by basmati rice in different cropping systems was recorded to be higher in legume based cropping systems as compared to basmati rice-wheat system. Application of organic manures did not show any marked influence on yield and nutrient uptake of basmati rice.


Per capita availability of pulses in India is constantly declining due to stagnant production of pulses and increasing rate of population. Therefore, concerted efforts are being made to increase pulses production by introducing short duration high yielding varieties as a niche crop in the rice-wheat system. Cowpea is one of the potential crops for this system because a number of high yielding cowpea varieties have recently been developed which mature in 60-70 days and require less irrigation and less fertilizers. This study was conducted to evaluate nine cowpea varieties including local and improved ones from IITA were evaluated at Majhera and Hawalbagh. The trials were conducted at three locations covering the plains and low hills. At Pantnagar., three varieties, IT-82D-889, IT97K-1042, and IT98K-1111 appeared very promising with mean yields of 1844.78 kg/ha, 1741.77 kg/ha and 1252.08 kg/ha respectively compared to Pusa Komal 887.85 kg/ha and local variety, 563.26 kg/ha. IT-1042 and Pusa Komal matured in 70-75 days but IT98K-1111and IT-205 matured in only 60-65 days. The other two varieties
from IITA, IT 93K-452 and IT98K-205 were also promising but their yields were low because of poor germination. IT97K-1042 was also very promising at Majhera and Hawalbagh with yields of 1467 kg/ha and 2139 kg/ha respectively but delayed in maturity. The results indicate a good possibility of increased cowpea cultivation.


A field experiment was conducted during Kharif season of 2003-04 and 2004-05 to evaluate the effect of nutrient management combinations on soybean yield and related parameters. Number of branches, LAI, dry matter accumulation per plant, number of pods per plant and 100-grain weight was highest in T12 (40 kg N + 80 kg P2O5 + 40 kg K2O ha-1). Grain yield (1794 kg ha-1), protein yield (627 kg ha-1), oil yield (321.06 kg ha-1) and gross return (Rs. 21887 ha-1) were maximum in same treatment (T12). However, net return (Rs. 12462 ha-1), and B: C ratio (1.40) were highest in T2 (20 kg N + 40 kg P2O5 + 20 kg K2O ha-1).

101. John, Jacob; Kerala Agricultural University, Karamana(India). Jose, Shirmila; Kerala Agricultural University, Karamana(India). Stephen, Roy; College of Agriculture, Vellayani (India). Investigations on the allelopathic compatibility of pepper with multipurpose trees for use as standard in homesteads. Journal of Plantation Crops (India). (Apr 2011) v.39(1)p.164-166 KEYWORDS: ALLELOPATHY. COCONUTS. PEPPER.


F30     Plant Genetics and Breeding


    Seeds of sorghum variety M 35-1 (R-99) were taken for this study. This variety was selected on the basis of its high kafirin content as per the data available. The long-term goal of the present study is the production of transgenic sorghum, which has soft endosperm with HMW-gs gene of gluten protein of the wheat. This makes the sorghum flour more palatable for making roti and also increases the dough quality and lysine content. One of the approaches to achieve this goal is to transform the HMW-gs genes with the seed specific fx-kafirin gene promoter. Present investigation records the results of our efforts on trying to clone the fx-kafirin gene promoter. The DNA extracted from M 35-1 (R-99) variety of sorghum were used to amplify the promoters and cloned in the pGEM vector. Genomic DNA was extracted from fresh etiolated young leaves of M 35-1 (R-99) sorghum variety. DNA sample were purified. Forward and reverse primers pairs were designed based on the published gene sequence of fx-kafirin protein gene. These genomic DNAs were used as template to amplify the promoters with designed primers. The combination of the primers was also used to amplify the promoter region of different sizes. The promoters were amplified on a large scale and purified. For vector preparation the pGEM vector were isolated from pre-transformed E. coli. The identification of pGEM plasmid was confirmed by restriction analysis. The vector were prepared in large quantity and treated with RNAase A and phenol: chloroform: isoamyl treatment to get purified plasmid DNA. The digested plasmid DNA was standardized with EcoR-1. Linearized plasmid and amplified promoter was then ligated using T4 DNA ligase. Ligation mixtures were used to transform bacterial strains DH 5fN host cells and plated on LB plates with ampicillin. The transformants are to be analysed for the presence of promoter inserts.


106. Bhadana, Vijaipal; ICAR Research Complex for NEH Region, Lamphelpat (India) Manipur Centre. Division of Plant Breeding. Khanna, V.K.; G.B. University of Agriculture and
The response of two varieties each of Gossypium arboreum and G. hirsutum to ovule culture, in vitro fiber growth from immature ovules and the effect of growth regulators on in vitro fiber and embryo development was studied. More callus growth (7.04) from immature ovules was found in BD-5 in the medium having 1.0 mg/l IAA and 0.5 mg/l kinetin, whereas least (0.01) was recorded in LH-900. Hundred percent ovules of both Lohit and BD-5 produced callus in a number of media, whereas ovules of Vikas and LH-900 did not give 100% callus induction frequency in any of the media. BD-5 ovules produced maximum fiber in vitro (5.60) on the medium having 1.0 mg/l kinetin. In general, Vikas was found to be more responsive for in vitro fiber growth followed by LH-900, BD-5 and Lohit, respectively. LH-900 produced in vitro ovules of maximum size (8.85) on the medium supplemented with 1.0 mg/l each of kinetin and NAA, whereas, minimum growth of ovules was observed in Lohit on the medium having 1.0 mg/l each of IAA and NAA. Maximum frequency of normal ovules (65.36%) was recorded in Vikas, when the medium was supplemented with 2.0 mg/l IAA and 0.5 mg/l kinetin. Lohit and BD-5 did not produce normal ovules on a number of media. Normal embryos were obtained in maximum frequency in LH-900 (36.00%) when the medium was supplemented with 1.0 mg/l IAA and 0.5 mg/l each of kinetin and NAA. On some of the media none of the genotypes produced even a single embryo. There was a complete correspondence observed between normal ovule frequency and normal embryo development frequency. Callus growth was found to be significantly and positively correlated with callus induction frequency in all the genotypes, whereas both of these were negatively correlated with normal embryo development frequency. Normal ovule development frequency exhibited significant and positive correlation with normal embryo development frequency in all the genotypes. The effect of smearing stigmas with modified Taylor’s medium was found to be significant in in vitro fertilization as it enhanced the frequency of hybrid embryos.


Present investigation was carried out with 47 genotypes including 11 lines, 3 testers and 33 F1s of brinjal. Best heterotic combinations over standard check for various characters were NDB 21 x PS and KS 356 x PU for days to 50% flowering (-32.65 and -28.57 %); PB 64 x PB 67 and NDB 21 x PB 67 for plant height (32.90 and 31.58 %); Punjab Sadabahar x PB 67 and PB 61 x PU for fruit length and diameter (51.62 and 200.42 %) respectively. The cross NDB 21 x PB 67 showed highest economic heterosis for most of the traits studied including the yield and yield attributing characters thus, this cross could be
advanced to recover desirable segregants for the improvement of yield and yield
contributing characters. On the basis of standard heterosis, it can be concluded that the
heterosis breeding would be advantageous for the improvement of brinjal for yield and its
component quantitative traits. The crosses NDB 21 x PB 67, PB 64 x PB 67 and PB 64 x PB 67
could be exploited as commercial hybrids as they demonstrated highly significant heterosis,
over the standard cultivar, Pant Samrat.

108. Jadli, Sandeep; G.B. Pant University of Agriculture and Technology, Pantnagar (India).
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and Technology, Pantnagar (India). Department of Vegetable Science. Potential verses
actual seed performance of field pea (Pisum sativum L.). Pantnagar Journal of Research
(India). (Jul-Dec 2008) v.6(2) p.270-274 KEYWORDS: PEAS. PISUM SATIVUM. VIGOUR.
QUALITY. SEED.

Potential and actual seed performance of 11 field pea (Pisum sativum L.) cultivars
was compared under lab and field conditions. Seeds of all the cultivars were evaluated for
different laboratory vigour tests. Field performance was evaluated by flowering, maturity
period, plant height at maturity, seed yield and other yield contributing characters. Results
from the present investigation showed that most of the vigour tests were good indicator of
field performance and results on coefficient of variation revealed that for all the characters
the PCV were always found more than their respective GCV. High heritability was associated
with test weight. Genetic advance and genetic gain was found highest for seedling vigour
index-I and plant height at maturity, respectively.

109. Sharma, Rishika; G.B. Pant University of Agriculture and Technology, Pantnagar
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Line X tester studies on two-line hybrids in rice (Oryza sativa L.). Pantnagar Journal of
Research (India). (Jul-Dec 2008) v.6(2) p.293-295 KEYWORDS: RICE. ORYZA SATIVA.
HYBRIDS. HYBRIDIZATION. HETEROSIS.

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Plant Breeding. Detection of diversity in germplasm collection of sorghum (Sorghum bicolor)
KEYWORDS: GENETIC DISTANCE. GERMPLASM. SORGHUM. RAPD. ISOENZYMES.
GENOTYPES.

Eighteen accessions of Sorghum bicolor used for the present study consisted of 4
genotypes of forage sorghum i.e. UPFS-34, Pant Chari 4, UP Chari 2 and UP Chari 3 and 14
genotypes of grain sorghum. The seed of most of the genotypes of forage sorghum was
reddish brown but the colour of the seed of grain sorghum was grayish. However, genetic
variation at DNA level among 18 accessions of sorghum revealed that 3 forage sorghum out
of 4 may have diverged long time back in evolution but one of these i.e. UP Chari 2 may
have evolved as a forage variety much later. The results suggest that forage sorghum might have evolved by gene arrangement of grain sorghum. In UP Chari and Swathi most of the genotypic characters are the same but there might be changes in gene patterns responsible for forage characters. However, three forage sorghums which got diversified indicate that most of the genotypes of forage sorghum were distantly related to grain sorghum.


Rapeseed-mustard oil is used as edible oil, as well as raw material for industrial products like soap, cosmetics, lubricants, paints, plasticizers, etc. In the present study six generations viz. P1, P2, F1, F2, BC1 and BC2 of three crosses, viz. PRQ-9701 x Kranti, JLM-23 x Kranti and PLEM-2003-9 x Varuna were grown in a RBD. The non-significant difference between F1 and their reciprocal F1 for erucic and oleic acid contents indicated absence of maternal influence. Estimation of effective factor pairs indicated that parents utilized in these crosses differed by at least two genes for both the fatty acids. For erucic acid content the observed ratio in F2 population (18:85:152:87:25) was not significantly different from the expected ratio (1:4:6:4:1), similarly for oleic acid the observed F2 ratio (23:86:150:84:25) was also not significantly different from the expected ratio which indicated digenic inheritance of these fatty acids. The simple additive-dominance model was adequate in the two crosses for erucic acid and in all the three crosses for oleic acid content, suggesting the absence of non-allelic interactions. In one cross additive x additive interaction was found significant for erucic acid but the additive effect had the highest magnitude. Therefore, the additive gene effects could be exploited by the pedigree method of breeding for selecting low erucic and high oleic acid content segregants in the F2 generation. Correlation studies among the major fatty acids revealed that erucic acid exhibited negative and significant correlation with palmitic, stearic, oleic, linoleic and linolenic acids. The linoleic and linolenic acids had a positive and significant association with each other as well as with oleic acid. Correlation studies revealed that the lines with 2% erucic acid coupled with approximately 40-45% oleic, 30-35% linoleic, 15-20% linolenic and 5% saturated fatty acids could be developed.


SSR markers were used to study genetic diversity in sorghum. Fourteen diverse sorghum accessions were used for the present study. A set of 6 SSR specific primer pairs were used for PCR amplification. A total of 34 bands were amplified all of which were polymorphic and there were 3 unique bands. Accessions GFS-4 and UPFS-38 were very
similar with a value of 0.728 whereas GFS-5 and FSH 92079 showed the lowest similarity value of 0.384. Accessions from IARI and NRCS were related to each other with a similarity value of 0.515 on an average. Accessions from Pantnagar and HAU were distantly related whereas accessions from GAU and ProAgro were similar to each other. The information content of the SSR data was high. The data from just one SSR locus allows the accessions to be uniquely identified. These SSRs can provide data that are useful to support genetic conservation.


An experiment was conducted with twenty six germplasm lines of Cucumis sativus var. hardwickii to assess the association between various yield and fruit quality traits. Correlation study revealed that characters showing highly significant positive correlation with fruit yield per plant were pulp breadth, number of fruits per plant, average fruit weight, fruit length, fruit diameter, vine length and number of lateral branches per plant. Seed cavity size showed highly significant negative correlation with fruit yield per plant.


Genetic variability, heritability and genetic advance for eleven yield contributing traits were studied in thirty three genotypes of garden pea. The study indicated existence of considerable amount of genetic variability for all the characters studied except pod breadth. Number of pods per plant, green pod yield per plant and plant height exhibited higher values of genotypic and phenotypic coefficient of variation. High estimates of heritability, genotypic coefficient of variation and genetic advance were observed for plant height, number of pods per plant and green pod yield per plant. These characters can be effectively improved through selection.


Forty five cauliflower genotypes of November maturity were evaluated at Vegetable Research Centre, G.B.Pant University of Agriculture and Technology, Pantnagar during 2007-
Phenotypic coefficient of variation was higher than the genotypic coefficient of variation for all the characters. It indicates the role of environment on expression of characters. Plant height and whole plant weight had higher heritability along with high genetic advance indicated additive gene effects. Plant spread and curd diameter exhibited high heritability along with low genetic advance indicated non-additive gene effects.


The bacterial mannitol-1-phosphodehydrogenase (mtID) gene conferring abiotic stress resistance was introduced into cauliflower (Brassica oleracea var. botrytis) by Agrobacterium mediated transformation. Petiole and hypocotyl explants were transformed with Agrobacterium strain LBA 4404 (pCaMVMTLDS). The explants were selected on kanamycin containing medium in three selection cycles of two week duration each with low intensity of selection in first selection cycle followed by high intensity selection. After completion of three selection cycles, 9.6 and 10.6 per cent kanamycin resistant petiole and hypocotyl explants were recovered respectively. A total of 80 putative transgenic plants were regenerated from the selected explants. Thirty plants were PCR positive for both selectable marker nptII gene and mtID gene with transformation frequency of 1.3 and 2.1 per cent from petiole and hypocotyl explants respectively.

117. Mall, A.K.; Narendra Deva University of Agriculture and Technology, Faizabad (India). Department of Genetics and Plant Breeding. Ram Bhajan; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Genetics and Plant Breeding. Kumar, K.; Narendra Deva University of Agriculture and Technology, Faizabad (India). Department of Genetics and Plant Breeding. Verma, O.P.; Narendra Deva University of Agriculture and Technology, Faizabad (India). Department of Genetics and Plant Breeding. Combining ability analysis for some metric traits over environments in Indian-mustard (Brassica juncea L. Czern & Coss) . Pantnagar Journal of Research (India). (Jan-Jun 2010) v.8(1) p.20-25 KEYWORDS: COMBINING ABILITY. BRASSICA JUNCEA. YIELD COMPONENTS.

Combining ability analysis was done using 20 lines × 3 testers for yield and its components over two environments. Significant differences due to lines, testers and their interaction showed the importance of both additive and non-additive gene action with later being predominant. Kranti and PBR-253 were good general combiners for seed yield per plant, plant height, length of main raceme, siliquae per plant and seeds per siliqua under timely sown (E1). JGM15-2 and PBR-558 were high GCA parents for seed yield and other traits under late sown (E2). The crosses HUJM-0202×Narendra Rai, KLM-145×NDYR-32 and JMWR-946-3-13×Narendra Rai in E1, and CS-611-1-3-1×NDYR-32, PBR-253×Narendra Rai and RH-0202×NDYR-32 in E2 were the most desirable specific combinations for seed yield and other yield related traits.

The components of genetic variance for grain yield, important yield components and certain quality traits were studied in seven crosses among eight basmati parental lines. The character means over six generations were subjected to scaling test. In the presence of epistasis, six parameter model was used to detect epistasis. The genetic analysis revealed the importance of additive components (d) for plant height, number of grains/panicle, panicle length, 1000-grain weight and kernel elongation ratio; dominance (h) and epistatic components for grain yield / plant, 1000-grain weight, panicle length, number of grains/panicle in most of the crosses. Dominance effect was important for kernel L/B ratio. Among the digenic interactions additive × additive (i) and dominance × dominance (l) effects contributed more for most of the characters. Additive × dominance (j) gene effect was important for 1000-grain weight in the cross C1, C3, C4 and C7; for grain yield per plant in C5 and C7 and for plant height, number of grains per panicle, number of effective tillers per plant, panicle length in C3 and C5. In general, the crosses revealed duplicate type non-allelic interactions for grain yield/plant. All the crosses exhibited heterosis in F1 and inbreeding depression in F2 generation.


Jatropha curcas is a multipurpose shrub and is considered to have originated in Latin America but presently grown throughout the arid, semi-arid tropical and subtropical regions of the world. Jatropha is easy to establish grows relatively quickly and is hardy. Being drought tolerant, it can be grown in eroded areas. Jatropha is desirable as a source for biofuels given that its seeds produce up to 40 percent oil, and the species in general is highly resistant to drought and pests. Processed oil from crushed mature seeds can be used in existing standard diesel engines, while the residue can also be processed into biomass to power electricity plants. Despite these characteristics, the full potential of Jatropha is far from being realized. Very little information is available on genetic diversity among Jatropha curcas genotypes. So the major objective of the present study is to assess the genetic diversity among twenty genotypes of Jatropha curcas using RAPD markers. Twenty highly polymorphic RAPD primers were used in the present study. The twenty random primers showed a total of 158 reproducible bands. The individual primer produced bands in a range of four (LC-77, LC-84, and LC-96) to 22 (LC-89) bands with an average of 7.9 bands per primer. The polymorphism per centage was 100 percent for every primer. Five primers gave a total of sixteen unique bands. PIC values ranged from 0.09 for primer LC-77 and LC-84 to as high as 0.81 for primer LC-87, with an average of 0.43. The average expected gene diversity ranged from 0.20 for primer LC-89 to a maximum of 0.47 for primer LC-93 with an average of 0.36. The values of the similarity coefficients ranged from 3.3% between
genotype 2 and 4 to a maximum of 93.7% between genotype 7 and 8. The dendrogram showed clear distinction among twenty genotypes by dividing the genotypes into seven clusters at 75 percent similarity.


In the wide crossing there are many factors that affect the success of fertilization. These include pre as well as post fertilization factors. In wheat x maize crosses similar barriers were also reported. Data were recorded for pollen tube abnormalities and embryo formation frequency for 29 wheat F1’s. Pollen tube abnormality was one of the pre fertilization barriers. Pollen tube growth in wrong direction, bursting, swelling, twisting and coiling of pollen tubes was some of the most common abnormalities. A highly negative correlation coefficient was found between pollen tube growth and embryo formation frequency.


Present study describes a protocol for DNA extraction and purification from individual seed in pigeon pea which is advantageous to follow when genetic material and resources are limited. The DNA concentration was estimated 56 µg/ml. RAPD analysis was conducted for characterization of early and late maturing genotypes of pigeonpea. However, only primer 27 showed variation among genotypes out of 14 primers used. This indicates narrow genetic base of genotypes under study. Thus, present DNA extraction protocol appears readily applicable to sort out genetic contamination at molecular level by PCR at routine basis in seed testing laboratories.


A set of fifty nine individual plants derived from a cross i.e., Birsa soy-1/JS-71-05 was used for studying variability and association analysis between eight quantitative characters.
The GCV, PCV were estimated as high in comparison to ECV, which indicated that variability was influenced by environment. High heritability was estimated for 100 seed weight (85.7%), germination percentage (84.0%), water absorption (82.2%) followed by dry matter weight per plant (81.2%) and it was moderate for seed yield per plant (75.6%) and pods per plant (75.0%), whereas, the lowest heritability was observed for plant height (63.8%). High value of expected genetic advance was observed for traits viz., germination percentage (46.30), water absorption (23.04), pods per plant (22.27) and dry matter weight per plant (15.19), whereas it was lowest for 100-seed weight per plant (2.46). Genotypic correlation coefficients were generally higher than phenotypic correlation coefficients. The study revealed that water absorption was positively and significantly correlated with germination percentage. Seed yield per plant was significantly and positively correlated with number of pods per plant and dry matter per plant.


F40 Plant Ecology


F50 Plant Structure
127. Alam, Md. Khursheed; Patna University, Patna (India). Department of Botany. Ahmad, Naheed; Patna University, Patna (India). Department of Botany. A cytotoxic investigation of Desmodium Desv. species. Pantnagar Journal of Research (India). (Jan-Jun 2010) v.8(1) p.86-88 KEYWORDS: CYTOTAXONOMY. DESMODIUM. ERECTNESS. MEIOSIS.

Karyomorphological and meiotic studies reflect differences in gene arrangement, segregation and recombination of gene as well as chromosome. These differences are cytotoxicologically important since they provide convenient parameter for establishing relationship among various species of a genus. It has also been effective in the delimitation of taxa. The present study is an endeavour to establish cytotoxic relationship among three selected Desmodium species of Patna, viz. Desmodium gangeticum L, Desmodium latifolium (L.) DC. and Desmodium triflorum L. by studying meiotic behaviour and recombination.


A screening study was carried out to detect the antagonistic potential of Bacillus spp. against Ganoderma applanatum and Thielaviopsis paradoxa, fungal pathogens of coconut. A total of 327 heat resistant, endospore producing bacilli were isolated from the rhizospheric soil and roots of coconut growing in Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and Maharashtra. All the isolates were tested for antifungal activity against G. applanatum and T. paradoxa by dual cultural technique on nutrient agar medium. The zone of inhibition was measured and percentage of inhibition was calculated. More than 90 % of the rhizospheric and root endophytic isolates were found to effectively inhibit the mycelial growth of G. applanatum, with a maximum inhibition zone of 12 mm and percentage inhibition ranging from 44 to 91. About 86% of the isolates inhibited the mycelial growth of T. paradoxa, with a maximum inhibition zone of 14 mm and percentage inhibition ranging from 42 to 93. Further tests of potent antagonists revealed that more than one mode of mechanisms like production of chitinase, siderophores, HCN, antibiotics, ammonia, & 946-1,3-glucanase and salicylic acid may be involved in the antagonistic activities. The results of this study revealed 13 Bacillus spp. having potential for use as biocontrol agents against G. applanatum and T. paradoxa, fungal pathogens of coconut.


An experiment was conducted to determine the optimal nutrient requirement of cashew under three different plant densities and to quantify the effect of different plant densities on the productivity of cashew. The experiment was laid out in a split plot design with cashew variety Ullal-3; under three plant densities viz., 200 (S1 - 10 mx5 m), 416 (S2 - 6m x 4m) and 500 (S3 - 5mx4m) plants /ha as main plot treatments and three fertilizer doses viz., 75 kg N, 25 kg each of P2O5 and K2O (M1), 150 kg N, 50 kg each of P2O5 and K2O (M2), 225 kg N, 75 kg each of P2O5 and K2O/ha (M3) as sub plot treatments with three replications. It was found that under high density planting system (S2 and S3), the soil moisture content at the base of the plant during February and March 2010 was higher as compared to normal density planting system (S1). The organic carbon content (OC%) was also higher in high density planting system plots (S2 and S3). The ground coverage and light interception by the canopy were also significantly higher under high density planting system (92-98 and 72-80 per cent, respectively) compared to normal density planting system (55-60 and 32- 42 per cent, respectively) during 2008. The higher cumulative nut yield of 7.0 t/ha and 6.3 t/ha was obtained in high plant density plots of 500 and 416 plants/ha, respectively. In normal density planting it was only 5.2 t/ha (for the first seven harvests). Fertilizer dose influenced the yield of cashew only up to first two harvests. The highest cumulative net profit of Rs. 1,67,002/ha (25% more than control) was obtained from the treatment of high density planting system (500 plants/ha) with lower fertilizer dose tested in this study and in normal density planting system with lower fertilizer dose, it was Rs. 1,34,012/ha.


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F62 Plant Physiology – Growth and Development


133. Awati, Mallikarjun G.; Regional Coffee Research Station, Thandigudi (India). D’souza, G.F.; Central Coffee Research Institute, Chickmagalur (India). Coffee Research Station.

**KEYWORDS:** PHYSIOLOGICAL FUNCTIONS.

An experiment was conducted to find out the interaction effects of rootstock-scion graft combination on gas exchange and morpho-physiological traits in arabica coffee seedlings. The study revealed significantly (p=0.01) higher gas exchange parameter in grafts compared to self grafted seedlings. Among the rootstock-scion graft combinations, Sln.4 rootstock (high root type) grafted with S.4695 scion a high light intensity tolerant type and Sln.8 (low root type) rootstock with Sln.6 scion (high root type) showed a maximum net photosynthesis, stomatal conductance and transpiration rate than self grafts. The significant increase on leaf, stem and shoot biomass observed in graft combinations of Sln.4 rootstock with Sln.10 scion and reciprocal grafts; Sln.4 rootstock with S.4695, S.4595 and S.4575 scions and Sln.6 rootstock with S.4595 scion combinations. The other graft combinations i.e. Sln.4 rootstock with Sln.10 (high WUE type) scion and reciprocal grafts, Sln.4 as rootstock with S.4695, S.4575 scions and Sln.6 rootstock with S.4695 scion have enhanced the production of root biomass, root length, primary and secondary roots and root to shoot ratio compared to self grafted seedlings. Similarly, Sln.4 rootstock with Sln.10, S.4595 scions and Sln.6 rootstock with S.4595, S.4695 scions improved the total dry matter production and cumulative water transpiration. Whereas, maximum water use-efficiency was recorded in graft combinations compared to self grafts. Hence, physiologically efficient reciprocal rootstock-scion graft combinations i.e. Sln.4 (T) with Sln.10, Sln.8 with Sln.6 and high root types of Sln.4 (T) and Sln.6 respectively with S.4695 and S.4575 scions could be utilized in crop improvement programme of coffee.

Thomas, Litty; Central Plantation Crops Research Institute, Kasaragod (India). Gupta, Alka; Central Plantation Crops Research Institute, Kasaragod (India). Gopal, Murali; Central Plantation Crops Research Institute, Kasaragod (India). George, Priya; Central Plantation Crops Research Institute, Kasaragod (India). Thomas, George V.; Central Plantation Crops Research Institute, Kasaragod (India). Efficacy of rhizospheric Bacillus spp. for growth promotion in Theobroma cacao L. seedlings. Journal of Plantation Crops (India). (Apr 2011) v.39(1) p.19-25

**KEYWORDS:** BACILLUS.

Cocoa (Theobroma cacao L.) trees harbour a diverse microbial communities of epiphytic, rhizospheric and endophytic organisms, many possessing plant growth promoting abilities. Since plant growth promoting rhizobacteria (PGPR) can significantly promote plant health and sustain agriculture by a variety of mechanisms, their potential for use in cocoa crop can be exploited. PGPR based products with strains of Bacillus are more successful in the field due to the fact that they produce spores which offer them ability to tolerate wide range of biotic and abiotic stress. This paper highlights the screening of selected Bacillus spp., isolated from the rhizosphere of cocoa growing in different agro-climatic and soil types in Kerala, Karnataka, Tamil Nadu and Andhra Pradesh, on the growth parameters of cocoa seedlings when grown in polybags. Statistically significant increase (P=0.05) over the control was observed in the tested parameters such as total seeding length (up to 37%), total fresh
weight (up to 73%) and total dry weight (up to 56%) of cocoa seedlings when they were inoculated with Bacillus spp. The overall improvement in seedling vigour through a significant increase in various growth parameters indicated that the Bacillus strains (Bacillus sp. ASB3, ASB12, CSB8, CSB16 and CSB17) had positive and effective plant growth promoting ability on cocoa seedlings. In addition to its plant growth promotion abilities the potential PGPR Bacillus spp. (isolates CSB8, CSB16, CSB17 and ASB12) also showed high abiotic stress tolerance, growing at higher temperatures (50°C) and salt concentrations (10% NaCl). These PGPRs were identified according to Bergey's Manual of Determinative Bacteriology and confirmed by Biolog® GEN III microplate identification system. The results of this study points to the potential of rhizospheric Bacillus spp. to enhance growth and vigour of cocoa seedlings when grown in polybags.


KEYWORDS: PLANT GROWTH SUBSTANCES.

In Coffea arabica, the phenotypic as well as genetic variability has been found low due to narrow genetic base and self-fertile nature of the species. Because of high similarity in phenotypic appearance among majority of arabica collections, selection of parental lines for inter-varietal hybridization and identification of resultant hybrids at an early stage of plant growth is difficult. Application of DNA markers provides a promising alternative for quick and reliable assessment of hybrid genotype. Sequence-related amplified polymorphism (SRAP) is a new molecular marker based on PCR technology. In this study, we evaluated the effectiveness of SRAP for molecular genetic analysis of selected arabica hybrids (F1) and their parents. Forty arabica hybrid progenies belong to four crosses were analyzed using 27 highly polymorphic SRAP markers. These 27 primer pairs generated seven different types of marker profiles, which are useful for discriminating the parents and hybrids. The number of bands amplified per primer pair ranged from 5.56 to 7.81 with average number of 6.42 bands. The polymorphic bands varied from 28.07 to 44.57% among different hybrids. The percent bands shared between hybrids and their parents ranged from 80.0 to 91.87%. Percentage of hybrid specific fragments obtained in various hybrid combinations ranged from 2.70 to 4.49% and ascribed to the consequence of recombination. Analysis of the SRAP marker profiles revealed that two hybrid progenies are closer to maternal parent, and other two are closer to paternal parent in banding pattern. The results obtained in present study revealed the effectiveness of SRAP technique in cultivar identification and hybrid analysis in coffee.

136. Murugesan, P.; Directorate of Oil Palm Research, Trivandrum (India). Regional Station. Haseela, H.; Directorate of Oil Palm Research, Trivandrum (India). Regional Station. Shareef, M.V.M.; Directorate of Oil Palm Research, Trivandrum (India). Regional Station.

American oil palm (Elaeis oleifera) is considered as promising genetic resource for breeding for dwarf palm which facilitates easy harvest. It is generally backcrossed to cultivated species of African oil palm (Elaeis guineensis) to obtain dwarf hybrids. During fruit development substantial weight increase was observed in case of fertile fruits, whereas, parthenocarpy fruits recorded no appreciable weight. However, changes in fruit components were more erratic during 46 -110 Days after Anthesis (DAA) than matured phase (124 to 180 DAA) due to inherent characteristics of oleifera. Mass maturity (seed filling) occurred at about 148-186 DAA at which time seed moisture content declined gradually from 87.65 to 19.69%. Oil formation in the mesocarp initiated (13.69%) approximately at 92DAA and peaked (67.7%) at 186 DAA. The entire seed development period from immature to the ripe fruit took about 186 days under tropical climate of Kerala. Onset of germination of 16.7% was obtained at 136DAA and highest germination (90%) reported at 186 DAA followed by 180 DAA (81.3%).


F63 Plant Physiology Reproduction
141. Mathew, Thomas M; Coconut Development Board, Kochi (India). CDB registers elite tall and dwarf mother palms for seedlings production. Indian Coconut Journal (India). (Sep 2011) v.74(05) p.18-20 KEYWORDS: DWARFS. MOTHER PLANTS.

142. Thomas, Regi J.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Shareefa, M; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Jacob, P.M.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Hybrids and hybridization techniques in coconut. Indian Coconut Journal (India). (Sep 2011) v.74(05) p.25-28 KEYWORDS: HYBRIDIZATION. COCONUTS.


H01 Protection of Plants – General Aspects

144. Bhat, Ravi; Central Plantation Crops Research Institute, Vittal (India). Regional Station. Krishnakumar, V.; Central Plantation Crops Research Institute, Vittal (India). Regional Station. Influence of planting material and nutrients on herbage and oil yield of patchouli grown under coconut. Journal of Plantation Crops (India). (Apr 2011) v.39(1) p.57-61 KEYWORDS: PRODUCTION. COCONUTS.

A study was conducted at two locations to know the influence of planting materials and nutrient management practices on production of patchouli under coconut in 2004-2005. Influence of graded levels of nutrients (40:20:20, 60:30:30, 80:40:40 and 100:50:50 kg N:P:K ha-1 crop-1 ) and vermicompost were studied on rooted cuttings and tissue cultured plants at Central Plantation Crops Research Institute, Research Centre, Kidu. Number of main branches, which is the main yield contributing attribute, was significantly influenced by nutrient levels. Dry herbage yield was not significantly influenced due to type of planting material indicating the similar performance of both rooted cuttings and tissue culture plants as intercrop in coconut. The yield of patchouli among different nutrient levels varied from 1092 to 1544 kg ha-1 and was significantly different. Significantly higher herbage yield of 1544 kg ha-1 was observed with 60:30:30 kg NPK ha-1. This suggests that 60:30:30 kg NPK is optimum for patchouli when intercropped in coconut plantation. Planting materials and nutrient levels did not show any significant impact on oil content. In general, the oil content varied between 0.34 to 0.56%. At Central Plantation Crops Research Institute, Regional Station, Vittal, patchouli was grown under coconut with organic farming approach. Different organic sources viz., farmyard manure, vermicompost, neem cake, composted coir pith and green leaf manure (gliricidia) were applied in different combinations. The results revealed that the Composted Coir Pith (CCP) + green manure (gliricidia) treatment recorded significantly higher plant height at 45 DAP (37.6 cm) over other treatments. Combined application of composted coir pith and green leaf manure produced significantly higher herbage yield (2098 kg ha-1 ) followed by combination of vermicompost, composted coir pith and green leaf manure (2043 kg ha-1 ). Oil content among the treatments varied from 1.09% to 2.3% with combined application of vermicompost + CCP+ green manure resulting in higher oil content (2.3%) and oil yield (47.1 kg/ha).
145. Thomas, Regi J.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Shareefa, M; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Jacob, P.M.; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Nair, R.V.; Central Plantation Crops Research Institute, Kasaragod (India). Strategy for planting material production in coconut. Indian Coconut Journal (India). (Jun & Jul 2011) v.74(2 & 3) p.36-40 KEYWORDS: PRODUCTION.

H10 Pests of Plants


The experiment was conducted on mollisol soil of Uttarakhand during 2001 and 2002 to investigate the effect of pesticides on bacteria and fungi in rice ecosystem with ten treatments - Phorate (P), Quinalphos (Q), Butachlor (B), (P+Q), (B+Q), (P+B), (P+B+Q), Control, Cartap hydrochloride and Dithane M-45. The bacterial and fungal population in soil increased with crop age in all treatments during both years. However, maximum increase was observed in control (no pesticide) and minimum in (P+B+Q) treatment. The use of combinations of pesticides in rice ecosystem imposed hazardous impact on population of bacterial and fungal population in soil.


Experience of parasitoids with host and host related products have effects on their behavior. Learning can be induced by conditioning parasitoids at various stages i.e. pre imaginal or imaginal (after eclosion). Here we studied the volatiles from damaged,
undamaged coconut leaflets and Opisina arenosella larval frass that cause electrophysiological and behavioural response in the bethylid parasitoid Goniozus nephantidis. The possibility of using the host frass for conditioning the parasitoids was explored. The damaged coconut leaflets released cyclopentanone, butanol, and alpha pinene and these compounds were absent in undamaged leaflets. Z-3 hexenol, a green leaf volatile was trapped from both damaged and undamaged plants. Alpha pinene released form damaged leaflets caused the highest electroantennogram (EAG) peak amplitude (0.330mV) in female antennae. This was followed by cyclopentanone (0.30mV), hexanone (0.29mV) and hexanal (0.29mV) which were all at par. G. nephantidis reared on Corcyra cephalonica conditioned with the larval frass of O. arenosella when provided a choice preferred to parasitize O. arenosella as compared to C. cephalonica. Conditioned parasitoids when released in the field caused 59 per cent reduction in larval population per leaflet as compared to 29 per cent reduction by unconditioned parasitoids two months after release. Conditioning of G. nephantidis with odors of O. arenosella will aid to enhance the host searching ability of the parasitoids that were reared on C. cephalonica.


Small cardamom (Elettaria cardamomum Maton) is cultivated under forest ecosystem. The soil habitat, which holds moisture even in summer months, is an ideal niche for entomopathogenic nematodes (EPN) to survive, sustain and multiply on insect larvae. Local isolate of EPN collected from cardamom niche as well as exotic strain from the Project Directorate of Biological Control, Bangalore were bioassayed on cardamom root grub (a major pest damaging the root system). Based on mortality, progeny production and LC50 studies, a local strain, Heterorhabditis indica (ICRI EPN-18) was found to be highly virulent. The EPN strain was multiplied in Galleria larvae and field experiments were conducted with EPN on root grub in comparison with stand- ard (insecticide treatment) and absolute control resulting with significant control of root grub with EPN. Trials in farmers’ plots indicated that root grub reduction ranged from 71.43 to 93.38% in EPN treated plot whereas there was increase or reduction of grub from about 6.69 to 18.39% in control plots. The EPN application methods viz., (a) EPN infected cadaver to be implanted at plant base 4 cadavers/plant (b) talc formulation to be mixed with compost and applied at plat base and (c) liquid suspension to be applied at plant base were also standardized. Among the formulations, cadaver application registered higher percentage of grub reduction in more number of fields. To outreach the technology among farmers, demonstration trials were conducted in farmers plot with EPN in comparison with standard check and absolute control with root grub reduction ranging from 72 to 99.6% in EPN treated plot.

A study was undertaken in the plantation crop based cropping system plots of Wayanad district to assess disease and pest incidence during different seasons in major crops and the variations in incidence of disease and pests between various cropping systems. In coconut, grey blight was extremely high during all seasons. Eriophyid mite attack was highest during south west (SW) monsoon (80%). Areca nut palms were mainly infected by Colletotrichum leaf spot, grey blight, inflorescence blight, button shedding and leaf rot during all seasons. Spindle bug infestation was highest during north east (NE) monsoon season (46.6%). In pepper, foot rot, yellow mottle, fungal pollu and marginal thrips was noticed in all seasons. In coffee, severe incidence of Colletotrichum leaf spot was noticed during summer (65.1%). Cardamom plants were mainly affected by leaf rot, leaf blotch and shoot borer during all the three seasons. In tea, the incidence of grey blight and stem borer attack was highest during summer. Study of seasonal variation in disease/ insect pest incidence between cropping systems showed that in arecanut, spindle bug attack was relatively greater when intercropped with nutmeg and tea during summer, with banana and nutmeg during SW monsoon and with coconut during NE monsoon. Incidence of foot rot was more in pepper grown along with tea during all seasons. During the two monsoon seasons, blister blight of tea was more in tea with pepper as intercrop and sooty mould was higher in tea intercropped with arecanut.

An experiment was undertaken to manage tea mosquito bug (Helopeltis antonii Sign.) in cashew through augmentative use of red ants Oecophylla smaragdina (F.). Pest population, extent of damage and yield parameters were recorded for three years for both treated and untreated plants, coinciding with flushing, flowering and fruiting phases of the crop. Bug population was significantly lower in plants colonized by red ants. The mean population values varied from 1.61 to 9.76 for untreated plants and 0 to 0.07 for treated plants. The extent of damage in untreated plants varied from 20.45 to 92.9 per cent, whereas the same was a negligible 0.02 to 0.009 per cent in treated plants. The mean number of immature nuts was significantly higher in treated plants as compared to untreated plants. The average yield recorded from red ant free trees varied from 0.39 kg to 3.85 kg per tree while that of plants colonized by red ants were significantly higher at 5.01 to 15.75 kg. Further, production period was also extended by two months in the latter, compared to untreated plants. Thus, the net effect of colonization by ants was an increase in yield by 400 per cent by the third year of the study. The cost benefit ratio worked out indicates that the red ant technology is economically more viable than chemical pesticides.

154. Soman, Sneha; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Mohan, Chandrika; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Compatibility of Metarhizium anisopliae (Metsch.) Sorokin with some chemical and botanical pesticides used in coconut pest management. Journal of Plantation Crops (India). (Apr 2011) v.39(1) p.196-200 KEYWORDS: PEST CONTROL. COCONUTS.


160. Josephrajkumar, A; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Rajan, P; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Mohan, Chandrika; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Namboothiri, C.G.N; Central Plantation Crops Research Institute, Kayangulam (India). Regional Station. Diversity and Management of scale insects infesting coconut. Indian Coconut Journal (India). (Jan 2011) v. 73(9) p. 25-29 KEYWORDS: PEST CONTROL. MANAGEMENT.

161. Nair, C.P.R.; Central Plantation Crops Research Institute, Kayangulam (India). Rajan, P.; Central Plantation Crops Research Institute, Kayangulam (India). Namboothiri, C.G.N.; Central Plantation Crops Research Institute, Kayangulam (India). Adoption of integrated pest management strategies for sustainable production in coconut. Indian Coconut Journal (India). (Apr 2011) v. 73(12) p. 11-17 KEYWORDS: PEST CONTROL. MANAGEMENT.

H20 Plant Diseases


Productivity of tomato is reduced due to early blight which causes both qualitative and quantitative losses. Infected seeds transmit the disease to seedlings. Detection of the pathogen with standard blotter method revealed 7.6 and 4.6 per cent recovery of Alternaria solani in untreated and pretreated tomato seeds respectively. Per cent germination of seedling was reduced in the infected seeds. Seed rot (96.0 per cent) and seedling infection (15.3 per cent) in infected seeds was higher than healthy seeds. Viability of the infected seeds was 83.0 per cent, which was 4.0 per cent in healthy seeds. Non significant reduction in seed weight, seed volume and density was recorded in infected than the healthy seeds.

germination of spores of Fusarium sp. from Mangifera indica L. Pantnagar Journal of Research (India). (Jul-Dec 2008) v.6(2) p.275-278 KEYWORDS: ETHEPHON. GERMINATION. SPORES. FUSARIUM. MANGIFERA INDICA. MANGOES. FUNGAL DISEASES.

Mango malformation is an economically important disease, which causes gross deformations of vegetative and floral tissues in Mangifera indica L. Fungi, mites, viruses, physiological factors, malformins and mangiferins are its reported causes. Recently, a role for stress ethylene has been implicated in mango malformation. Ethrel was found to stimulate the germination of spores of isolates of Fusarium sp. from mango cultivars at concentration from 5 ppm to 100 ppm. However its higher concentration was toxic for spore germination. These findings are discussed in relation to higher population of Fusarium sp. in diseased tissues, could be due to stress ethylene, generating in response to various stresses.

164. Neetu Rani; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Plant Pathology. Pradeep Kumar; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Plant Pathology. Tewari, Rashmi; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Plant Pathology. Efficacy of antibiotics and plant extracts against Pseudomonas savastanoi pv. glycinea the incitant of bacterial blight of soybean. Pantnagar Journal of Research (India). (Jul-Dec 2008) v.6(2) p.299-301 KEYWORDS: ANTIBIOTICS. PLANT EXTRACTS. PSEUDOMONAS. BACTERIOSES. SOYBEANS. GLYCINE MAX. MEDICINAL PROPERTIES.

165. Mishra, Kamlesh Kumar; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Molecular Biology and Genetic Engineering. Singh, U.S.; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Plant Pathology. Singh, Munna; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Plant Physiology. Finger printing of Trichoderma isolates for their antagonistic behavior against Rhizoctonia solani. Pantnagar Journal of Research (India). (Jul-Dec 2008) v.6(2) p.302-304 KEYWORDS: TRICHODERMA. ISOLATION. RHIZOCTONIA SOLANI. ANTAGONISM. FUNGAL DISEASES. BIOLOGICAL CONTROL.


The invitro compatibility of entomopathogenic fungi, Beauveria bassiana and Metarhizium anisopliae with four different fungicides was evaluated. The active ingredients with five different concentrations were selected to test their influence on mycelial growth and spore germination of entomogenous fungi. The formulation tested affect conidial germination and vegetative growth of the fungus in different levels. All the fungicides were detrimental to growth and spore viability of entomogenous fungi, B. bassiana and M. anisopliae. Lower doses were relatively safer to the fungus as compared to higher doses of fungicides. Among all fungicides tested carbendazim was completely inhibitory in its action at all the concentrations and caused 100 per cent growth inhibition in both the entomogenous fungus tested. While captan proved relatively safer for the entomogenous
fungi, with fairly good amount of spore germination. Compatible formulation could be used simultaneously with this entomogenous fungus in integrated pest management programme.


Cocoa sweating collected on the first day of fermentation of beans was used for the preparation of culture media. When cocoa sweating as collected from the fermentary was used as liquid medium to grow Trichoderma harzianum and Metarhizium anisopliae, there was no growth. Therefore, growth and sporulation of both the fungi in different dilutions of cocoa sweating were compared with that in potato dextrose broth (PDB) and potato jaggery broth (PJB). Growth and sporulation of both the fungi were the highest in cocoa sweating (CS) diluted with tap water (TW) in the proportion CS:TW1:4 (CS1:4). Both the biocontrol agents did not exhibit any difference in growth and sporulation in CS 1:4 and in CS1:4 supplemented with 15g dextrose and pH adjusted to 6.5. Growth and sporulation of both the fungi in CS1:4, PDB and PJB increased with number of days of incubation and was the highest on 20th day after inoculation. When 800 ml CS1:4 was used to grow the biocontrol agents and to prepare talc formulations using 2kg talc powder, the moisture content was 8% after 72h of drying. Shelf life of talc formulations of both the biocontrol agents could be maintained for 5 months with very high colony forming units (CFUs). The CFUs/g of talc formulations of both the fungi stored for 6 months were less than that in the 5th month.


Root (wilt) disease, which is debilitating in nature, is one of the major constraints affecting coconut productivity in Kerala. Adoption of integrated management practices especially effective utilization of inter space in the coconut garden by inclusion of various crops shall constitute an ideal approach to improve the health and productivity of coconut palms. An experiment was undertaken at the Regional Station of Central Plantation Crops Research Institute, Kayamkulam, Kerala from 2004 to 2008 to evaluate the economics of high density multispecies cropping system (HDMSCS) model with different annual and perennial crops in an existing 39 year old West Coconut Tall (Cocos nucifera) garden affected by root (wilt) disease. Various crops such as elephant foot yam, pineapple, banana, black pepper and nutmeg were raised as component crops with coconut in the HDMSCS. The overall coconut yield under the system improved by around 17% during the fourth year of experiment when compared to the initial yield of 53 nuts/palm due to the management practices including recycling of organic biomass produced through vermicomposting and basin raising and incorporation of green manure crop. In the total cost of cultivation incurred, cost of labour was the highest, ranging from 50 to 75% during 2007-08 and 2005-06, respectively. The net return varied from Rs.15,064 to Rs.25,687 during 2005-06 and 2006-07, respectively. In the absolute monetary terms, the contribution of inter/mixed
crops in the HDMSCS varied from 30% (2005-06) to 51% (2006-06). Analysis of coconut equivalent yield showed that the overall contribution of inter/mixed crops was about 40%, indicating the beneficial effects of the cropping system in coconut gardens, especially in areas where root(wilt) disease is a problem causing reduction in farm family income. The economic advantage of HDMSCS over mono cropping was 61% with a BC ratio of 1.59 indicating that the coconut based high density cropping system is economically viable in root (wilt) disease affected areas provided the disease incidence is well managed by adopting integrated practices and other production and price related risks are at normal level. Analysis of root (wilt) disease incidence from the experimental field indicated significant decrease in the disease incidence due to adoption of HDMDCS in disease affected gardens.


Leaf rot disease is an integral part of root (wilt) disease of coconut and hence its control a great importance. Potential of biological control agents against leaf rot pathogens have been established. Field performance of talc-based B. subtilis and P. fluorescens against leaf rot (individually and in consortium mode), growth of bioagents in coconut water-based media for enriching bioformulations and viability of the bioagents in organic carriers based
formulations were evaluated. A field experiment conducted with treatments of B. subtilis, P. fluorescens, B. subtilis + P. fluorescens and Phytosanitation + B. subtilis + P. fluorescens in comparison with control showed a decline of disease index in newly emerged leaves of treated palms (higher disease ameliorative effect through consortium of B. subtilis and P. fluorescens). Multiplication of bacterial (P. fluorescens) and fungal (Trichoderma viride) bioagents could be achieved in coconut water-based media-moderate-good growth of P. fluorescens in coconut water (pH adjusted to 7.0), coconut water amended with peptone at 1% or jaggery at 5% or 10% levels comparable with its growth in King's B broth; moderate-good mycelial yield of T. viride in coconut water-based media with or without jaggery amendment comparable to its growth in potato dextrose broth. The bacterial and fungal biocontrol agents as grown in coconut water-based media could be processed into talc-based bioformulations (quality comparable with such products evolved using conventional media). The talc-based formulations admixed with organics viz., neem cake, vermicompost and coir pith (1: 1w/w) that were individually packed also assured reasonable period shelf-life (six months) of bioagents, compared well to corresponding other media. Thus mass production of popular biological control agents in coconut water based medium followed by their bioformulations through fortifications with popular organics has been successfully evolved.

H60 Weeds and Weed Control


A field experiment was conducted during winter (rabi) season of 2003-04 and 2004-05 at Agronomy Research Farm to find out an effective herbicide to control mixed weed flora of wheat crop. Complete control of A. arvensis and P. minor was noticed under sulfosulfuron treatments (25 and 37 g/ha) where as density of P. hysterophorus and total weed were drastically reduced which reflected into lower weed dry weight and higher weed control efficiency. Sulfosulfuron at 37g/ha produced maximum grain yield among different herbicides and remain at par with its lower dose (25g/ha), both rates of pendimethalin (1.00 and 1.25 kg/ha) and weed-free.

Field experiment with eight (8) treatments to control weeds in berseem was conducted in two consecutive years during 2006-07 and 2007-08 in three replications. Pre-emergence application of butachlor 1.0 or 2.0 kg/ha or alachlor 2.0 kg/ha were found to be effective in controlling weeds in berseem, resulting in higher fodder yield. Highest fodder yield was recorded from butachlor applied 2.0 kg/ha. However, dry matter of weeds at 45 DAS stage was lower with alachlor applied 2.0 kg/ha. Weed control efficiency was highest (83.1%) with alachlor applied 2.0 kg/ha and weed index was lowest with application of butachlor 2.0 kg/ha. The fodder yield was reduced by 52.5% due to uncontrolled weeds in weedy check. Coronopus dedymus was the major non-grassy weed in the berseem crop.

**J10 Handling, Transport, Storage and Protection of Agricultural Products**


**KEYWORDS:** WASTE MANAGEMENT. AGRICULTURAL WASTES. VALUE ADDED. APPLES. BIOFUELS. FOOD INDUSTRY. ETHANOL.

Processing waste utilization is the necessity and a challenge to the food industry and is a priority to make the units economically viable, through the recovery of value added byproducts. Since apple pomace poses a greater problem for its disposal, there is a strong need to have an integrated approach for utilization of apple pomace. Production of ethanol from apple pomace is one of the attractive options due to its supply at cheap price, minimum land requirements and independent of weather conditions during fermentation. Keeping in view the above facts, a study was conducted to produce ethanol from fermented apple pomace under controlled conditions. Experiments for natural fermentation of apple pomace with initial sugar variables, pH levels and fermentation time were carried out and based on the results obtained from natural fermentation, experiments for second phase i.e. inoculated fermentation with variables as amylase treatment (treated), pH (4.0), yeast strains (Y2, Y5 and Y12) and fermentation time (0-84 h) were carried out. Study revealed that initial pH and fermenting time both affected the process of ethanol production, in both the conditions but effect of initial pH was more significant in comparison to fermenting time.


**KEYWORDS:** COMMUNITY DEVELOPMENT. SUSTAINABILITY.

Evaluation on the performance and sustenance of coconut clusters revealed better group characteristics and capacity development in the case of clusters facilitated by Central Plantation Crops Research Institute (CPCRI) and Coconut Development Board (CDB) and their performance also were rated as good against the objectives set. Even though the performance of the rubber producers' group was the highest among all, the present status of the coconut groups facilitated by CPCRI and CDB are highly encouraging in terms of their
performance, increased knowledge, skills, improved behavioural changes and their strong and responsible leadership, being in the early period of development. Further, the coconut groups have several limitations like unorganized markets, inadequate government support limited to project periods and lack of a permanent establishment and infrastructural facilities for storage and processing, unlike the well established commodity clusters. Based on the inferences drawn, an integrated model coconut cluster at the panchayat level by linking the ward level coconut clusters through a common support centre with continued government support for input use and marketing for effective functioning and sustenance is suggested.

**K01 Forestry – General Aspects**


Communication attains a centre stage in all interactive processes like JFM where people discuss, resolve, decide, communicate, plan, lead, and execute the development issues collectively. The process involves constant deliberation and consultation, information sharing, frequent meetings, collective decision-making and suitable modifications with the feedback. In view of its strategic role in JFM process, it becomes imperative to design a process friendly communication strategy and interventions for successful implementation of the programme. Keeping the importance of communication in view, the present study was conceptualized to find out the major communication interventions and strategies used by forest department and members of VFCs to motivate beneficiaries for popular participation in JFM. The study was carried out in two JFM villages of Kumaun region of Uttarakhand. The findings of the study reveal that most of the respondents came to know about JFM from friends/relatives and neighbours followed by village Pradhan and forest officials. Agenda through village watchman, personal contact by Pradhan and forest officials were major approaches followed by VFC members and forest department to popularize the JFM in study villages. Most of the respondents consulted friends/relatives and neighbours for further details about JFM. Other sources consulted by beneficiaries for getting information on JFM were fellow villagers, Pradhan and forest officials. Forest officials were proved as most credible sources of information regarding JFM, followed by friends and relatives.

**K70 Forest Injuries and Protection**


Dehusked barnyard millet grain is cooked like rice to make jhangora bhath, chencheda, kheer in all Kumaoni and Garhwali households. Experiments were conducted to study the cooking qualities of barnyard millet (VL-172) at four moisture levels (8, 10, 12 and 14%, db). The hydration capacity (0.37-0.53 mg/kernel) and swelling capacity (0.30-0.44 µl/kernel) of milled barnyard millet increased linearly, while the cooking time of millet decreased with the increase in milling time at each experimental moisture levels. The hydration capacity increased by 0.0819, 0.0814, 0.0871 and 0.0924 g/g kernel whereas swelling capacity enhanced by 0.1178, 0.1148, 0.1205 and 0.1330 µl/kernel from 0 to 20% degree of polish at 8, 10, 12 and 14 per cent moisture levels respectively. The cooking time of milled barnyard millet decreased from 8 to 5 min at 8 and 10 per cent moisture levels and from 7 to 5 min at 12 and 14 percent moisture levels respectively with the increase in degree of polish.


Socio-economic characteristics, extent of knowledge about integrated management of selected pest and diseases of coconut and technical efficiency of mechanical climbing devices were analysed in a study conducted among 87 coconut climbers in Kasaragod District. Matrix scoring, one of the Participatory Rural Appraisal tools, was employed to elicit data for the participatory assess- ment of the climbing devices. Among the climbers 22 per cent were illiterate, 57 per cent had primary school level of education, eight per cent were landless and 64 per cent were having only 10 to 50 cents of land holding. Only 14 per cent of the climbers used mechanical devices for climbing coconut palms. Seventy four per cent of the climbers attended to plant protection measures, mainly control measures for bud rot disease and rhinoceros beetle, apart form harvesting and crown cleaning. Except one climber, none of them had attended any training on PP measures in coconut. Majority of the climbers did not possess the required level of knowledge about the control measures recommended against bud rot disease and rhinoceros beetle infestation. The average time taken to set the device on the tree was more for the Chemberi Joseph model of climbing device but it took less time for climbing up the tree. CPCRI model was assessed better on the dimension of safety for the climber and simplicity in the design of the device. Chemberi Joseph model was assessed better on the dimensions of less drudgery involved in climbing, suitability for using under all weather situations and cost of the device.


P01 Nature Conservation and Land Resources

183. Verma, Vijai; Lucknow University (India). Department of Botany. Sharma, Y.K.; Lucknow University (India). Department of Botany. Status of ambient air quality in residential and commercial areas of Lucknow. Pantnagar Journal of Research (India). (Jan-Jun 2010) v.8(1) p.81-85 KEYWORDS: ENVIRONMENTAL FACTORS. URBAN AREAS. URBAN ENVIRONMENT. AIR POLLUTION. POLLUTION CONTROL.

Status of ambient air quality at seven road transactions in commercial areas and four in residential areas of Lucknow (Uttar Pradesh), India was studied during 2002 to 2007. Four pollution parameters viz. Suspended Particulate Matter (SPM), Respirable Suspended Particulate Matter (RSPM), SO2 and NOx were studied. Concentration of SPM and RSPM exceeded the prescribed standards in commercial areas as well as residential areas whereas concentrations of SO2 and NOx levels were within standard limits in both the areas. Based on Air Quality Index (AQI), commercial areas- Charbagh (156.54), Hussainganj (153.34), Hazaratganj (151.77) were severely polluted whereas Vikasnagar (106.18) and Gomtinagar (111.73) with low AQI were safest residential areas but fell in highly polluted category.


Recent threat on global warming and change in climate are not only the topic related with agricultural and biomass productivity; but on the basis of quality consciousness consumers demand, agriculturalists are indebted to offer due importance to the quality of the agricultural commodities. Quality attributes depends mainly upon the biochemical constituents. How far climatic changes influence the quality attributes of tea are unknown. In the pilot scale study, polyphenols, catechins and their oxidative enzyme are considered and variations in their ratios with respect to prevailing climatic conditions of the Anamallais are attempted. Crop shoots were collected at monthly intervals and subjected to determination of polyphenols, catechins and polyphenol oxidase assay. Weather data collected at UPASI meteorological observatory were used for correlation and factor analysis. Irrespective of the clones, cultivars registered higher quantum of polyphenols followed by Assam cultivar. Clones studied within the taxonomic group also significantly varied among them, irrespective of the sampling time. As the catechins are polyphenol derivates, the same trend was observed with total catechin content. Among the clones, SA-6 registered least amount of polyphenols and catechins when compared to other clones. Ratio of catechin to polyphenol exhibited different trend; Cambod cultivars registered higher values.
in catechin, polyphenol ratio followed by China and Assam cultivars. Polyphenol oxidase activity was significantly varied among the jats and the clones within the taxa. Microclimatic variables played an important role in accumulation of predominant quality constituents, polyphenols or catechins and the enzyme, poly phenol oxidase. Sunshine hours positively related with the above said biochemicals while rainfall has negative influence on the biochemical constituents. Maximum temperature had positive and significant correlation with quality constituents whereas, minimum temperature registered negative impact on their production. Relative humidity recorded at 8.00 am and 2.30 pm exerted negative influence on polyphenols, catechins and PPO activity. Multiple regression models derived based on the climatic variables are presented and discussed in detail.

**P11 Drainage**


**KEYWORDS**: TISSUE ANALYSIS. PLANT TISSUES. DISORDERS. NUTRIENT DEFICIENCIES. LITCHI CHINENSIS. LEAVES.

Leaf analysis has been successfully used as a guide in diagnosing nutritional problem and as a basis for fertilizer recommendation in fruit tree in many countries. However, little information is available on leaf nutrient standard for litchi which is a native of china. An alternative approach to the traditional method of developing leaf nutrient standards is to survey high productive orchard and assume that nutrients concentration in these orchards are optimal. This technique was used to establish tentative leaf nutrients concentration standard for litchi in Uttarakhand. Nitrogen status in leaf sample was lowest (1.19%) in Pithoragard belt, whereas phosphorus content was particularly low in Dehradun (0.16%) and Pithoragarh (0.13%) litchi belt. As regards to potassium content, it was also very low in Dehradun (0.67%), Pithoragarh (0.67%) and Haridwar (0.95%). Very low sulphur content in litchi orchard of Pithoagarh area seems to be a major concern. As regards to micronutrients concentration, Zn content was combatively lower in Ramnagar (17ppm) and Kichha (18ppm) area while Cu status seems to cause problem in near future. Iron was sufficient in the entire orchard while Mn status was comparatively lower in Ramnagar and Kichha area. Poor nutritional status of leaves in Litchi orchards primarily in hill areas seems to be a cause of concern and warrant proper nutrient management strategy. A tentative leaf nutrients standard proposed for litchi orchard of Uttarakhand is 1.78%, 0.25%, 2.68%, 0.16%, 26ppm, 13ppm, 179ppm and 13ppm for N, P, K, S, Zn, Cu, Fe and Mn respectively.

**P33 Soil Chemistry and Physics**

Effect of waterlogging durations on uptake of macro and micronutrients by maize was evaluated during kharif 2004 and 2005 season. The treatments consisted four durations of waterlogging (0, 3, 7 and 10 days) and four varieties (Tarun, Pragati, Gaurav and Navin). The waterlogging treatments was given at knee-high stage by keeping ±5 cm continuous submergence for different durations under field conditions. Waterlogging significantly reduced the maize yields as well as its nutrient compositions, consequently reducing the uptake of N, P, K, Fe, Mn and Zn by the crop.

P34 Soil Biology

187. Thampan, P. K.; Peekay Tree Crops Development Foundation, Kochi (India). Biodiversity of the soil life in support of coconut production at optimum levels. Indian Coconut Journal (India). (Apr 2011) v.73(12) p.18-23 KEYWORDS: SOIL. BIODIVERSITY.

P35 Soil Fertility


A study was conducted to relate the effect of bentonite clay and moisture regimes on nitrogen mineralization in Mollisols of Tarai region of Uttarakhand with eight treatments viz. control (soil), nitrogen, wheat straw, FYM, wheat straw + nitrogen, FYM + nitrogen, rice straw and rice straw + nitrogen. Rice and wheat straw were applied 6 t ha⁻¹, while FYM was applied 10 t ha⁻¹. Nitrogen 20 kg ha⁻¹ was used as starter dose. Treatments were incubated at 300 centigrade in a BOD incubator for 90 days in triplicate using two bentonite (0% and 10%) levels and two moisture (field capacity and saturation) regimes. On 90th day, the highest cumulative mineralized nitrogen was found in case of nitrogen treated soil i.e. 133.6, 113.3 mg kg⁻¹ at field capacity with 0 and 10% bentonite levels, respectively; and 57.1, 49.5 mg kg⁻¹ at saturation with 0 and 10% bentonite levels, respectively. The lowest mineralization was recorded in wheat straw i.e. 45.3, 40.1 mg kg⁻¹ at field capacity with 0 and 10% bentonite respectively; and 19.7, 17.3 kg⁻¹ at saturation with 0 and 10% bentonite
levels, respectively. Both bentonite and moisture regimes significantly altered nitrogen mineralization at each date of observation. By the end of incubation (90th day), reduction of mineralization by 10% bentonite and saturated moisture regime was found to be 13.2 and 60.5 per cent, respectively.

190. Agarwal, Mina; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Soil Science. Nand Ram; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Soil Science. Shri Ram; G.B. Pant University of Agriculture and Technology, Pantnagar (India). Department of Soil Science. Long-term effect of inorganic fertilizers and manure on physical and chemical properties of soil after 35 years of continuous cropping of rice-wheat. Pantnagar Journal of Research (India). (Jan-Jun 2010) v.8(1) p.76-80 KEYWORDS: INORGANIC FERTILIZERS. ORGANIC FERTILIZERS. SOIL CHEMICOPHYSICAL PROPERTIES. RICE. ORYZA SATIVA. WHEATS. TRITICUM AESTIVUM. CONTINUOUS CROPPING. CROPPING SYSTEMS.

An ongoing field experiment was conducted at Long-term fertility experiment, Pantnagar, to study the effect of inorganic fertilizer and manure on physical and chemical properties of soil of seven treatments viz. 100% NPK, 100% NPK+Zn, 100% NP+Zn, 100% N+Zn, 100% NPK+FYM, 100% NPK-S+Zn and Control, four replications of each treatment. Farmyard manure is applied at the rate of 15 t/ha. Soil bulk density, hydraulic conductivity, penetration resistance, pH, electrical conductivity, organic carbon and available macronutrients were determined. In general among all the treatments 100% NPK+FYM showed better result and control gave poorest result.

Q01 Food Science and Technology


Q02 Food Processing and Preservation


The experiments were conducted to study the physical properties of barnyard millet (VL-172) at four moisture levels (8, 10, 12 and 14%, db). The size characteristics, i.e., length, width, thickness, length-width ratio, width-thickness ratio, grain mean diameter and sphericity varied from 2.43-2.57 mm, 1.94-2.01 mm, 1.26-1.30 mm, 1.26-1.28,1.54-1.56, 1.81-1.89 mm and 0.73-0.74 among different experimental moisture level. The gravimetric properties, i.e. 1000-kernel weight (3.48-3.73 g), 1000-kernel volume (3.00-3.27 ml), bulk density (0.7489-0.7828 g/ml), true density (1.2134-1.2639 g/ml), porosity (0.3249-0.4074),
angle of repose (19.19-22.71°), coefficient of friction (0.2339-0.2561) and hardness (3.2-4.3 kgf) were correlated with moisture content through regression analysis. At each moisture level, low values of correlation coefficients between grain dimensions indicates that the grain dimensions were independent of each other and hence, no suitable model for describing the relationship between grain dimensions could be developed. The porosity depended on the grain size and shape. The thousand-kernel weight and volume were highly positively and negatively correlated with grain dimensions respectively. Bulk density was positively correlated whereas true density was negatively correlated with thousand-kernel weight of the grain.


An experiment was undertaken to explore the possibility of utilization of whey for the preparation of flavoured whey drinks. The whey drinks were prepared from cow milk chhana whey, buffalo milk chhana whey and mixed milk chhana whey by adding different flavour (orange, mango ripe and pine apple) and colour (orange, red and yellow). It was concluded that, whey drink prepared from buffalo milk chhana whey coagulated by 4% lemon juice or 0.3% and 0.4% citric acid was the best quality with pineapple flavour. The storage study showed that the citric acid whey drink remained good instead of lemon juice whey drink.


An experiment was conducted to study the compositional changes in milk samples as influenced by the addition of 0.3% and 0.5% of formalin preservative in cross bred and local cow milk samples. Addition of formalin increases the acidity, while casein % decreases in both type of milk. The extent of decrease during storage was practically the same in 0.3% and 0.5% formalin samples. No significant difference was recorded in lactose, total solids, fat and specific gravity by addition of formalin in fresh and during storage upto 48 hours. 0.3% and 0.5% formalin is best for preservation of milk samples for chemical examination only.


The experiment was conducted to study the suitability of different types of milk and coagulant for chhana whey. 10 samples of milk were taken from cow milk, buffalo milk and mixed milk. Chhana whey was obtained by adding citric acid (0.2, 0.3 and 0.4%) and lemon
juice (2.0, 3.0 and 4.0%). It was concluded that cow milk (4.5% fat) chhana whey coagulated by 0.2% and 0.3% citric acid was best for yield and quality parameters.

S01 Human Nutrition – General Aspects


Abstract Membrane filtration of proteolytic enzyme digests and NaOH extracts of solvent extracted flours of cashew by-products resulted in reduction in antioxidant activities. Gel filtration of proteolytic enzyme digests of solvent extracted flours of cashew processing by-products on Sephadex G 25 revealed the presence of two peaks one immediately after the void volume and another later during elution. Reducing power, arginine and proteins content reduced in enzyme digests and alkali extracts after gel filtration and membrane filtration.


U10 Mathematical and Statistical Methods


Many authors have studied the probability models in fertility particularly in birth intervals and parity specific fertility rates involving stochastic processes and renewal theory during the recent years. Such studies have played important roles in fertility analysis. In the proposed study, an attempt has been made to look into the phenomenon of parity progression from reliability or survival point of view based on the models for hazard rates obtained by Pachal (1992), wherein it has been assumed that fertility rates decline uniformly by parity. The hazard rates decline gradually with advancement in parity. Distribution of women in the first parity with respect to the time of birth and hazard rate of births for first parity has been obtained from a cohort of 313 females. Lateron a comparative analysis between observed mean and standard deviation to the expected mean and standard deviation of the time interval also has been done.
A study was carried out to study the land use pattern in Maniyar Watershed, located between 78022° to 78028° E longitude and 30020° to 30025° N latitude, varying from 600 to 2400m above mean sea level (amsl) and covering an area of 5519 ha (55.19 km²). Results indicated that agricultural area had reduced from 62 per cent to 30 per cent from 1960 to 2002, while forest area increased marginally from 25 to 26 per cent of the total watershed area but barren land increased drastically from 13 to 27 per cent during the same period of 42 years. Therefore, conclusion is drawn that agricultural land is shifting very fast into unproductive lands and need corrective measures to protect natural resources of the watershed for its sustainable development.
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