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In vitro plant regeneration through multiple shoot induction in diploid cotton *Gossypium arboreum* L. (cv. PA 255 and PA 402)

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ABSTRACT : A rapid and simple *in-vitro* multiple shoot induction protocol was developed from shoot apical meristem explants of cotton. *In vitro* raised shoot tip explants from diploid cotton (cv. PA 255 and PA 402) were used to produce multiple shoots on a medium containing various concentrations of growth regulators. Among the combination used, MS medium containing BAP (2mg/L) and kinetin (1mg/L) combination was found to be the best for induction of multiple shoots within four weeks of culture. These shoots were transferred to shoot elongation medium containing reduced concentration of BAP and kinetin. Elongated shoots were separated and rooted in modified MS medium supplemented with NAA. The frequency of shoot number/explant was in the range of 8.5 to 17.2. Statistical analysis (LSD) showed that there was no significant difference among number of shoots produced/explant. The regenerated plants were finally established in soil. This protocol is considered to be more suitable for micropropagation, germplasm preservation and genetic transformation experiments.

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Characterization of cotton varieties and hybrids on the basis of their morphological traits and molecular techniques

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ABSTRACT : Characterization of six varieties, one hybrid and its parents was carried out on the basis of their morphological traits and protein-banding pattern. Variations in stem pigmentation and hairiness, leaf shape and colour, petiole pigmentation, presence of nectar and gossypol glands, flower colour, pollen colour, anther and filament colour, bract shape and its pigmentation etc were used as the major features to distinguish and characterize the varieties.

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Inheritance of resistance to cotton leaf curl virus (CLCuV) in American cotton (*Gossypium hirsutum* L.)

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ABSTRACT : The genetics of cotton leaf curl virus (CLCuV) disease resistance in cotton (*Gossypium hirsutum* L.) was studies during *kharif*, 2001 at CCS Haryana Agricultural University, Hisar. The material comprised of six crosses (four, S x R and one each of S x S and R x R) involving two resistant parents (LRA 5166 and RS 810) and two susceptible parents (HS 6 and F 846). Six basic

generations (P_1, P_2, F_1, F_2, B_1 and B_2) were taken under two distinct environments. All the plants in all the basic generations of cross HS6 x F 846 (S x S) were found to be susceptible. In F_2 generation of cross LRA 5 166 x RS 810 (R x R), all the plants were resistant to CLCuV indicated that genes involved in the resistance to CLCuV were identical in both the resistant parents. The resistance to cotton leaf virus (CLCuV) in LRA 5166 and RS 810 was governed by two dominant genes in homozygous condition.

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Estimates of additive, dominance and epistatic variation for fibre quality characters in upland cotton (*Gossypium hirsutum* L.)

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ABSTRACT : Thirty-four progenies of upland cotton produced by crossing 17 genotypes with two testers in a simplified triple test cross fashion along with their parents were evaluated in a randomized complete block design with three replications and estimated additive, dominance and epistatic components of genetic variation for various fibre quality characters. The analysis of variance for the test of epistasis revealed the presence of epistasis for all the fibre quality characters, except for fibre fineness. Both additive as well as dominance genetic components were significant for all the fibre quality characters i.e. ginning out-turn, lint index, 2.5 per cent span length, fibre strength and fibre fineness. The magnitude of additive genetic component 'D' was higher than dominance genetic component 'R' in all the characters studied which resulted the involvement of partial dominance in the inheritance of these characters. The covariance 'F' was non significant for all the characters indicating ambi-directional dominance.

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Combining ability for yield and its components over environments in upland cotton (*Gossypium hirsutum* L.)

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ABSTRACT : In a line x texter analysis for combining ability, both additive and non additive variances were present with the former playing a major role for most of the characters studied. Among male parents, A-72-15 was the best general combiner for seed cotton yield, followed by H 777. The parent H 777 in addition to yield also exhibited good GCA effects for plant height and boll number -- a potent yield component. However, the best combiner for yield contributing trait (boll number) was H 1156. For another important yield component, boll weight, male parent NC 34 and Seabal were better. Similarly, HP Acala for number of monopods, H 1098 for number of sympods and G 67 for seed index were found to be the best general combiners. In general, none of the male or female parent under discussion was observed to posses high GCA effects for all the traits under study. However, considering the merit of characters of economic importance, parents A 72-15, H 777, H 1156 and H 1098 among the males and IAN 579 among females may be considered for future breeding programmes. In hybrids combinations, SA 278 x G 6030 with significant sca effects in all the environments was found to be best.

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Problems and prospects of *Gossypium arboreum* cultivation in Madhya Pradesh

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ABSTRACT : Under the present situation of changing scenario, especially the rainfall pattern with prolonged dry spells, the pest complex, the environment pollution and incresing demand of textile industries, the potential of *arboreum* cotton which is must better than even hybrids under rainfed conditions need to be exploited. The *arboreums* is the best friend of the cotton farmer and therefore the scope is tremendous. There is a need to develop early varieties suitable for double cropping, which will be remunerative for farmers.

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Stability analysis of north Indian cultivars of Asiatic cotton (*Gossypium arboream* L.)

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ABSTRACT : Stability analysis of the material consisting of 27 genotypes grown at two different locations *viz.,* Hisar and Sirsa consecutively for *kharif,* 1993 and 1994 thereby creating four environments E_1 to E_4 was conducted. The observations were recorded on eight characters related to seed cotton yield and fibre quality characters. Variance due to genotypes, environments and genotype x environment interaction was significant for all the characters studied. Studies to estimate the relative stability of Asiatic cotton genotypes revealed that except two characters, major component of genotype x environment interaction was a liner function of the environment. Simultaneously, consideration of all the parameters of stability revealed that only three genotypes, HD 305, HD 302 and LD 327 were found to be stable for seed yield and its components.

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Studies on fibre development in cotton

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ABSTRACT : In present study, six cultivars *viz.,* JKHy 1 and KHH 110 (hybrids), Vikram and Khandwa 2 (*hirsutum*) and Jawahar Tapti and KWA 7 (*arboreum*) were investigated for their fibre growth and development. The fibre elongation and fibre dry weight were found to be closely associated with species and varietal differences. The rate of elongation was not uniform over the entire elongation period, but was found to be fibre age development. The dry weight (secondary thickening) started only after elongation ceased and continued to increase till bolls opened. Corresponding to the age, fibre length and dry matter accumulation showed a definite kinetics of fibre growth in all the six cultivars.

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Correlation and path coefficient analysis of fibre quality characters in rainfed hybrid cotton as influenced by boron application

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ABSTRACT : The effect of boron application on fibre quality was studied in rainfed hybrid cotton. Correlation and path analysis of different fiber quality characters were studied. Seed cotton yield was positively and significantly associated with ginning percentage and 2.5 per cent span length but negatively correlated with fineness and maturity coefficient. Ginning percentage had highly significant positive correlation with mean fibre length and seed cotton yield/ha. Maturity coefficient was positively and significantly correlated with fineness and 2.5 per cent span length. Fineness was also positively and significantly correlated with 2.5 per cent span length. Path coefficient analysis indicated that the ginning per cent had highest positive direct effect followed by fineness, maturity coefficient and 2.5 per cent span length. Fineness had positive indirect effect with maturity coefficient, ginning percentage, 2.5 per cent span length, mean fibre length and bundle strength. Ginning percentage had positive indirect effect on fineness, mean fibre length, maturity coefficient, 2.5 per cent span length and bundle strength.

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Combining ability in top cross hybrids of upland cotton based on cytoplamic male sterlity

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ABSTRACT : Combining ability studies for yield and yield contributing characters were undertaken using top cross technique in *Gossypium hirsutum* cotton. The results revealed that the male parents AKH 31R, AKH 14R, AKH 16R and AKH 72R were good general combiners for yield and yield related characters.

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Genetic evaluation of *Gossypium arboreum* genotypes for yield and fibre quality

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ABSTRACT : Seventeen genotypes of *Gossypium arboreum* were evaluated to estimate mean performance and different genetic parameters at Cotton Research Station, Abohar in a randomized block design with three replications. The genotype LD 814 had highest mean performance for seed cotton yield, bolls/plant and boll weight. Highest seed index was observed in RG 8. The mean performance of genotype CISA 310 for ginning out turn, HD 424 for 2.5 per cent span length and RG 251 for fibre strength was highest. Seed cotton yield had highest genotypic and phenotypic coefficient of variation. The estimates of phenotypic coefficient of variation were higher than those of genotypic coefficient of variation. Seed cotton yield had significant and positive correlation with bolls/plant and boll weight. Similarly, boll weight was positively correlated with seed index and lint index. Bolls/plant and lint index had high positive direct effects on seed cotton yield.

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Seed quality improvement of margional lots of cotton by processing

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ABSTRACT : Studies were conducted to ealuate the efficacy of combined grading with seed cleaned cum grader and specific gravity separator, with different lots of (Substandard lots) cotton cv. MCU5. The results indicated that by combined grading of seeds with cleaned cum grader and specific gravity separator could improve the quality of seed (>MSCS level of 65%) by selection of heavier and middlings of specific gravity separator.

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Combining ability studies in diploid cotton

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ABSTRACT : A study was conducted during 2001-02. The crosses were effected as per line x tester (4 x 7) method to assess the combining ability effects for major qualitative and quantitative characters including seed cotton yield/plant in diploid cotton hybrids. The estimates for *gca* effects revealed that, GMS 6 showed positive significant *gca* effects for days to 50 per cent flowering, bolls/plant, ginning per cent and seed cotton yield/plant proved best general combiner indicating additive gene action. Amongst male Jayadhar showed positive significant *gca* effects and proved better general combiner for days to 50 per cent flowering, plant height, monopodia/plant, sympodia/plant, bolls/plant, boll weight, ginning per cent and seed cotton yield/plant.

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Evaluation of underscript varieties of cotton for yield and fibre quality

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ABSTRACT : More than 60 undescript varieties/hybrids of cotton are under cultivation in Punjab. In this study, samples of about 30 undescript varieties of cotton were collected from farmers field. Out of these, 16 undescript varieties, which cover a considerable area in Punjab, were evaluated at Cotton Research Station, Abohar along with standard checks F 1861 and LH 1556 in a randomized block design with three replications. The observations were recorded on seed cotton yield, number of bolls/plant, boll weight (g), seed index, ginning outturn (%), lint index and fibre quality parameters. None of the undescript varieties gave seed cotton yield higher or *on a par* with the two checks. Amongst undescript varieties, performance of P36-1, Sikanderpuria and M 1352 was better than other varieties. Similar results were obtained for number of bolls/plant. The boll weight was the highest in undescript variety Anandgarh. The undescript varieties Paras, Anandgarh and PK 54-2 had highest seed index. The ginning outturn of most of the undescript varieties was higher than the check varieties F 1861 and LH-1556. The highest ginning out turn was observed in P 36-1. With regards to fibre quality parameters, Local Selection-1 from village Kundal had 2.5 per cent span length of 28.80 mm. The 2.5 per cent span length in other undescript varieties varied between 23.60 mm in LH 911 to 26.60 mm in Paras. The undescript variety Udangsuper had a fine fibre with a micronaire value of 3.5. The fibre strength was also highest (23.1 g/tex) in Sikanderpuria.

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A high yielding *desi* cotton variety *Veena* suitable for northern Telangana zone of Andhra Pradesh

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ABSTRACT : With the introduction of tetraploid cotton the area under *desi* cotton has reduced consideraly. MDL 1875 was developed during eighties with a view to replace the old variety Saraswati. MDL 1875 recorded a mean seed cotton yield of 1183 kg/ha as compared to Sarswati (949 kg/ha) and LRA 5166 (807 kg/ha). Under minikits MDL 1875 recorded a mean cotton yield of 994 kg/ha as compared to 716 kg/ha by Saraswati. It has a good yield potential (16-20 q/ha) coupled with resistance to grey mildew and desirable fibre properties.

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Production potential, water and nitrogen use efficiency of hybrid cotton as influenced by drip irrigation and nitrogen fertigation

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ABSTRACT : Field experiments were carried out at Tamil Nadu Agricultural University, Coimbatore, during winter (August, 1998-February, 1999) and summer (March-August 1999) season to study the water use efficiency (WUE), nitrogen use efficiency (NUE) and productivity of hybrid cotton (TCHB 213) under two irrigation methods (drip and furrow) and different levels and methods of nitrogen (N) applicaiton. The experiments were laid out in split plot design with three replications. The results revealed that drip irrigation and drip fertigation substantially increased the yield attributes and seed cotton yield as compared to control. The increase in seed cotton yield in drip irrigation over furrow irrigation was 9.3 and 13.6 per cent during winter and summer seasons, respectively. Drip fertigation and drip band application of N increased the seed cotton yield by 10.8 and 9.7 per cent in winter and 15.0 and 10.9 per cent in summer seasons respectively over furrow band application. By adopting drip fertigation, saving of irrigation water up to 43 per cent and nitrogen utilization by 50 per cent achieved in hybrid cotton in both the seasons of study. Drip irrigation and drip fertigation substantially increases the WUE and NUE as compared to furrow irrigation with band application in both the seasons.

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Productivity and profitability of cotton influenced by fertilizer management under Tungabhadra Project area of Karnataka

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ABSTRACT : A field experiment was undertaken for two *kharif* season of 1999-2000 and 2000-2001 to study the response of *intra hirsutum* cotton hybrids to fertilizer management levels in black soil under irrigated situation. The trial was laid out in split plot design with three replications. The soil of the experimental plot has a pH of 8.10 and available N, P and K content of the soil as 290, 40 and 380 kg, respectively. The experiment consisted of 14 treatment combinations with two hybrids as

main plots (V_1 : DHH 11 and V_2 : NHH 44) and seven fertilizer levels as sub plots. The results revealed that hybrids responded to additional dose of fertilizers during their extended growth period. NHH 44 produced significantly more seed cotton yield (1905 kg/ha) as against the DHH 11 (1739 kg/ha). This higher seed cotton yield was due to higher/plant yield and more number of bolls/plant. Amongst the fertilizer levels, application of 50 per cent RDF (applied in two splits, 75 per cent during December and remaining 25 per cent after 30 days of first application) produced significantly higher seed cotton yield (1967 kg/ha) and monetary gross returns of Rs. 39340 as compared to other fertilizer management levels. The extent of yield advanttage was to the tune of 14 per cent over application of only RDF (1724 kg/ha). In conclusion, an additional dose of 25 per cent was sufficient for extended growth period to harvest an additional yield economically.

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Economic feasibility of drip irrigation and nitrogen fertigation in hybrid cotton

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ABSTRACT : Field investigation were carried out at Tamil Nadu Agricultural University, Coimbatore, during winter (August, 1998-February, 1999) and summer (February-August, 1999) seasons to evaulate the economic feasibility of drip irrigation and nitrogen fertigation in hybrid cotton (TCHB 213). The results revealed that drip irrigation recorded significantly higher seed cotton yield in both the seasons. The economic analysis shows that the net income obtained under 100 per cent drip irrigation system was higher than that of furrow irrigation. Drip irrigation system registered lower benefit-cost ratio because of higher investment cost of drip unit. However, a net extra income ranging from Rs. 3853 to 20165 ha^{-1} could be obtained by adopting drip irrigation system as against furrow irrigation. The net profit per unit quantity of water and nitrogen applied were also higher with drip irrigation and fertigation respectively. The pay back period for 100, 75 and 50 per cent drip irrigation regimes were 1.60, 1.64 and 1.71 years for winter crop and 2.38, 2.61 and 2.88 years for summer crop respectively. Thus, though drip irrigation and fertigation indicates the economic feasibility for higher productivity and sustainable hybrid cotton production.

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Effect of spacing and nitrogen on growth and yield of the *deshi* hybrid cotton AKDH 7

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ABSTRACT : Field experiments were conducted during three years in *kharif* seasons from 1999-2000 to 2001-2002 at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola under rainfed condition. *Deshi* hybrid cotton AKDH 7 was grown with four spacings and four nitrogen levels in FRBD with three replications. The results revealed that the spacing of 60 x 45 cm recorded maximum seed cotton yield (1303 kg/ha) which was *at par* with 60 x 30 cm spacing (1260 kg/ha) and significantly superior to the widely spaced at 60 x 60 (1076 kg/ha) and 60 x 75 cm (958 kh/ha). Seed cotton yield significantly increased with corresponding increase in the N level up to 50 kg/ha and there after seed cotton yield differences between 50 and 75 kg N/ha treatment did not reach up to level of significance. At 50 kg N/ha, a higher yield of 32.5 and 11.7 per cent was recorded over 0 and 25 kg N/ha, respectively.

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Impact of gypsum on soil and cotton productivity grown with and without alkali irrigation water in sodic vertisols

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ABSTRACT : A field experiment was conducted on hybrid cotton (PKV HY 4) during 2000-2001 in the Research Area, Soil Science Department, Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola. Gypsum was applied before last harrowing and mixed in upper 15 cm soil. An incorporation of gypsum with increasing levels with and without alkali water through sprinkler enhanced significantly seed cotton yield. The sprinkler irrigation even with alkali water gave higher net monetary returns over control. The soil properties recorded after experimentation showed remarkable changes.

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Production of pycnidia and pycnidiospores of *Rhizoctonia bataticola* on various hosts under laboratory conditions

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ABSTRACT : Among the eight isolates tested for induction of pycnidia and pycnidiospores *in vitro* on different plants, three isolates *viz.,* cow I, cbn 11 and okr II were found to produce pycnidia and pycnidiospores. Cowpea and clusterbean were found to be suitable hosts for the production of pycnidia and pycnidiospores. Stem served as the most favourable part. Sunflower, okra and cotton failed to support the production of pycnidia and pycnidiospores. However, pycnidiospores of these isolates were able to produce disease symptoms on germinated seedlings of clusterbean, cotton, cowpea, okra and sunflower.

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Rapid preparation of DNA from *Rhizoctonia solani* and *R. bataticola* fungi causing root rot in cotton

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ABSTRACT : An easy and rapid protocol for isolation of DNA from *R solani* and *R.. bataticola* was developed. The modified method yielded higher concentration (per unit volume) of superior quality DNA compared to CTAB method and DNA extracted by using commercial kit. Besides, the new method can be carried out in eppendorf tubes using small amount of tissue and extraction buffer.

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Biology of *Spodoptera exigua* (Hubner) (Lepidoptera : Noctuidae) on cotton

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ABSTRACT : Studies on the biology of *Spodoptera exigua* (Hubner) were undertaken on cotton variety F 1861 in screen houses at Entomological Research Farm, Department of Entomology, Punjab Agricultural University, Ludhiana. Number of eggs/egg mass varied from 17 to 102 (mean : 61.52 ± 16.81) during different months (May to December). Oviposition took place during night with peak period being 04.00-06.00 hours in May, July and September and 06.00-08.00 hours in November. Incubation period was 3.07 ± 0.80 days and mean hatchability 90.65 per cent. The larvae passed through five instars and total larval period was maximum (25.92 ± 2.06 days) during November-December and minimum (11.52 ± 1.81 days) during June with a mean of 17.01 ± 5.77 days. Pupal period was 7.31 ± 1.85 days. The mean larval and pupal survival was 72 and 80 per cent, respectively. The peak mating time was 01.00 to 04.00 hours and mating position was tail to tail. The mean pre ovipositionm, oviposition and post oviposition periods were 2.74 ± 1..36, 3.71 ± 0.51 and 2.33 ± 0.72 days, respectively. The mean longevity of male and female adults was 6.51 ± 1.77 and 8.60 ± 2.05 days, respectively. The mean fecundity was 478.21 ± 231.6 eggs/female and six ratio (male : female) was 1 : 1.24. The mean time taken to complete the life cycle was 27.39 ± 8.42 days.

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Economic implications of IPM based interventions on profitability of cotton in small scale cotton production system

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ABSTRACT : Low production and productivity of cotton in the Vidarbha region is attributed mainly to erratic nature of monsoon and severe incidence of cotton bollworms. The problem gets aggravated in small scale production system due to lack of resources with the farmers. Anticipation of the factors contributing to low productivity and introduction of innovative interventions through Institute Village Linkage Programme (IVLP) to counter the same marks the abstract of present contribution. Increase in the productivity of farmers involved in the project over the conventional approach (farmers practice) by 25 per cent in *Bt* cotton, 16 per cent each in IPM and IRM along with 18 and 16 per cent for management of bacterial blight and grey mildew of cotton, respectively translates into increased profitability of 24 per cent (*Bt* cotton), 21 per cent (IPM), 24 per cent (IRM), 7 per cent (PAT), 23 per cent (bacterial blight) and 21 per cent (grey mildew) over the farmers practice. High net returns besides the cost benefit ratio in IVLP intervention over farmers practice is indicative of successful transfer of technology, an essential component for the sustainability of small scale cotton production system.

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Effect of different nitrogen levels and plant spacings on bollworms incidence and yield under sprayed and unsprayed conditions

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ABSTRACT : The present investigations were carried out to study the effect of different levels of nitrogen and plant spacings on the incidence of bollworms on American cotton variety LH 1556 during *kharif,* 1999, both under sprayed and unsprayed conditions at Cotton Experimental Area, Department of Plant Breeding, Punjab Agricultural University, Ludhiana. Higher level of nitrogen (75 and 112.5 kg/ha) and closer plant spacing of 15 cm recorded significantly higher bollworms incidence as compared to lower level of nitrogen (0 and 37.5 kg/ha) and wider plant spacing (30, 45 and 60 cm)both under sprayed and unsprayed conditions.

J. Cotton Res. Dev. **19** (1) 105-108 (January, 2005)

Detection of DNA-A and satellite (DNA-□) in cotton leaf curl virus (CLCuV) infected weeds and cotton plants using PCR technique

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ABSTRACT : Thirty one weed samples collected from and around cotton fields in the districts of Fatehabad, Sirsa and Bhatinda during May and August, 2004 were tested for the presence of cotton leaf curl virus using PCR technique. A set of primers designed based on the conserved sequence of coat protein region were used. Similarly, primers Beta l and 2 designed to amplify DNA-□ were used. Weeds i.e. *Sida spinosa, Achyranthus aspera* and *Clerodeadron eneansi* were positive for CLCuV while *Corchorus acutangularis, Trianthema monogyna, Eclipta alba* and *Tribulus terrestris* showed amplification for the DNA-□ component.

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Assessment of bioagents isolated from wilt suppressive soils against *Fusarium oxysporum* f. sp. *vasinfectum* (FOV)

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ABSTRACT : Five isolates of two fungal antagonists *viz., T. harzianum* and *T. viride* isolated from cotton wilt suppressive soils were tested against *Fusarium oxysporum* f. sp. *vasinfectum* (FOV) causing wilt of diploid cottons by dual culture technique and volatile substances produced by them *in vitro.* The Pachora isolate of *T. harzianum* was found to be superior over other isolates in arresting mycelial growth of FOV. Volatile substances produced by 3 days old culture of *T. harzianum* and *T. viride* were more effective in inhibiting the growth of FOV than 7 days old cultures. All fungicides under study were found to be effective in inhibiting the growth of the FOV *in vitro.* Seed treatment with captan in combination with *T. harzianum* (Pachora isolate) was found to be the best with lowest wilt incidence in pot culture experiment.

J. Cotton Res. Dev. **19** (1) 112-114 (January, 2005)

AICCIP, Pune centre : National centre for wilt screening since 1936

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ABSTRACT : Genotypes of diploid cottons developed by cotton breeding are being screened against Fusarium wilt by "Pune centre techniques". Since the inception of this centre in 1936, twelve thousand nine hundred eighty three diploid cotton genotypes from different AICCIP centres were screened against Fusarium wilt. Only 979 genotypes were observed to be resistant (0.01-10.00% disease) while 1205 were found to be moderately resistant (10.01-30.00 disease). Out of these genotypes, many have been released for general cultivation.

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Economics of cotton production in Haryana

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ABSTRACT : Based on primary bdata collected with respect to 80 cotton farmers in Hisar and Sirsa district of Haryana, the costs and returns of both American (*Gossypium hirsutum*) and *desi* (*G. arboreum*) cotton were computed. The average cost of cultivation/ha for American and desi cotton were computed. The average cost of cultivation/ha for American and desi cotton were worked out to be Rs. 17157 and Rs. 17203, respectively during 1996-97 to 1998-99. However, the variable cost constituted about 56 per cent of the total cost of both *hirsutum* and *arboreum* cotton. The rental value of land, human labour and expenditure on plant protection chemicals were the main items of cost in both the species. The average gross returns were as Rs. 17801 and Rs. 16648 in *hirsutum* and *arboreum* cotton respectively. The returns over variable costs were not only positive but highest on medium farms, followed by large and small farms, thereby revealing viable proposition for its cultivation.

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Effectiveness of different communication media for transfer of cotton production technology

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ABSTRACT : The study was conducted on 120 cotton growers selected from four villages of Hisar district, Haryana during 1999 to ascertain the effectiveness of different communication media for transfer of cotton production technology. The farmers were given training about cotton production technology through four selected communication media namely, lecture plus discussion, printed material plus discussion, audio plus discussion and visual plus discussion. The study revealed that farmers gained maximum knowledge (18.67%) when the improved cotton production technology was communicated through visuals plus discussion and gained minimum through lecture plus discussion (9.47%). In the study, visuals plus discussion was found most effective, followed by printed material plus discussion, audio aids plus discussion and lecture plus discussion teaching methods.

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Trend analysis of cotton production in Haryana

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ABSTRACT : Based on time series data for 1966-67 to 1996-97 compiled from the Statistical Abstract of Haryana, the present study worked out the compound growth rates and quinquennial changes in the area, production and productivity of cotton in the state. The analysis of data revealed that the area, production and productivity of American cotton had increased at the annual rates of 6.62, 7.70 and 1.02 per cent between 1966-67 to 1996-97. Both the area and production of *desi* cotton had a growth rate of 1.14 and 0.50 per cent, respectively during the same period. The total area, production and productivity of cotton (both *desi* and American) had shown a positive growth rate of 4.06, 5.36 and 0.70 per cent per annum during the study period.