

COTTON Innovate



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RESEARCH ROUND UP

Seed drill attached to power weeder for cotton sowing under HDPS

A seed drill attached to hand driven power weeder was assembled with the help of local manufacturer for sowing under HDPS. This can be useful for sowing of cotton under HDPS in case of marginal farmers. The sowing of *G. hirsutum* and *G. arboreum* varieties with the seed drill was attempted at the station and the seed drill was suited for seed placement at 10cms and 20 cms.



Seed drill attached to power weeder



Sowing of *G. hirsutum* cotton at 67.5x10cms

LITERATURE SCAN

Heterologous expression system (silkworm): A promising approach to produce recombinant spider silk protein with improved mechanical properties

Although, the spiders are well known for their superior quality of silk, their cannibalistic nature and inability to grow in concentrated colonies stymied commercial production of spider silk. Recent advances in genetic engineering have provided a path to produce various types of recombinant spider silks. However, large scale production of spider silk remains challenging. Recombinant silk protein produced in heterologous expression systems such as microbes, plants and mammals cannot restore the full potential of native fibre in terms of mechanical strength.

Teule et al., (2011) demonstrated that these limitations might be overcome by using silkworm as surrogate host. Also, the silkworms can be efficiently transformed using piggyBac vector. The specific piggyBac vector used in their project was designed to carry genes with several vital features such as, the *Bombyx mori* fibroin heavy chain (fhc) promoter to target expression of the foreign spider silk protein to the posterior silk gland and fhc enhancer to increase expression levels to facilitate assembly of the foreign silk protein into fibers. Their piggyBac vectors also encoded A2S814, a relatively large (78 kDa) synthetic spider silk protein with both elastic (GPGGA)₈ and strength (linker-alanine)₈ motifs. Importantly, the synthetic spider silk protein was flanked by N- and C-terminal domains of the *B. mori* fhc protein essential for storage of liquid silk dope in lumen and fiber formation in spinning duct. Their results showed that, chimeric composite silkworm/spider silk produced by this method was found to be tougher than fibers produced by the parental animals and as tough as native dragline spider silk fiber.

Practical Implications:

Spider silks act as excellent candidates as biomaterials for tissue engineering, guided tissue repair, drug delivery and cosmetic products.

Spider silk can be used for industrial materials such as nanowires, nanofibers and surface coatings.

Cotton researchers can make use of this research in order to improve the fiber strength of cotton fiber using protein motifs from *B. mori* responsible for increasing fiber strength.

Reference: Teule F, Miao Y. G, Sohn B. H, Kim Y. S, Hull J. J, Fraser M. J, (2011) Silkworms transformed with chimeric silkworm/spider silk genes spin composite silk fibers with improved mechanical properties. *Proc. Natl. Acad. Sci. USA* 109: 923–928.

Institutes:

Department of Molecular Biology, University of Wyoming, Laramie, WY- Florence .

College of Animal Sciences, Zhejiang University, Hangzhou 310029, People's Republic of China.

Eck Institute for Global Health, Department of Biological Sciences, University of Notre Dame, Notre Dame.

Contributed by Sachin More, SRF, Usha Satija, RA, Abhijit Daspute, SRF and N. Ramakrishna, SRF, CICR, Nagpur

CICR Foundation Day Celebration

CICR Foundation Day was celebrated on 1st April, 2014. Dr. G. Balasubramani, gave the introductory remarks and conducted the event "Express your ideas in one minute" under the different topics.

The winners under each category were awarded with prizes

- 1. New Ideas to develop Institute Facilities:** Mr. K.Velmourougane (1st Prize), Dr. S.N.Rokde (2nd prize) and Miss. Usha Satija (SRF) (3rd prize)
- 2. Ideas for cotton farmers' prosperity:** Dr. Anuradha Narala (1st Prize), Mr. K.Velmourougane (2nd prize) and Mr. (SRF) (3rd prize)
- 3. Wild Idea on cotton 2050:** Dr. Annie Sheebha (1st Prize) and Mr. Sampath Kumar (2nd prize)
- 4. What do you like about CICR:** Mr. Izaj Ahmed (1st Prize), Dr. Chinna Babu Naik (2nd prize) and Mr. Muchli (3rd prize)
- 5. Three steps to end corruption in India:** Dr. Anuradha Narala (1st Prize), Dr. K. P. Raghavendra (2nd prize) and Dr. V. S. Nagrare (3rd prize)
- 6. Do we need a Dictator in India:** Dr. R. R. Gupta (1st Prize)
- 7. Advertise a product to sell cotton boll:** Mr. Sampath Kumar (1st Prize)

Dr. K. R. Kranthi, Director, CICR, in his talk congratulated all the winners and exhorted all to work harder and in harmony for progress of the institute. The winners under each category were awarded with prizes.



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Economics of GMS based *desi* cotton (*Gossypium arboreum* L.) hybrid seed production in north zone

R. A. MEENA*, D. MONGA AND GHANSHYAM

Central Institute for Cotton Research, Regional Station, Sirsa – 125 055

*E-mail: rameenacotton@rediffmail.com

ABSTRACT : The increasing demand of *desi* cotton hybrid seed and its cheaper seed production cost due to GMS property can play an important role in boosting the economy of farmers in north zone. In this zone sowing is done in about 1.22 lakh ha area under *desi* cotton and approximately 4575 q hybrid and varieties seed is required annually. To promote the hybrid seed production in this zone, economics of hybrid seed production of *intra arboreum* GMS based hybrid CICR 2 (CISAA 2), was worked out and /ac net profit during 2006, 2007 and 2008 was observed Rs 78703, 69362 and 69310, respectively. It is concluded that cotton hybrid seed production using GMS line as female parent is a profitable enterprise in north zone.

Key words: Cotton, economics, *Gossypium arboreum*, hybrid seed production

In North zone presently about 80 per cent of cotton area is under cultivation of *Bt* hybrids which helped in increasing the cotton production in this zone from 31 lakh bales in 2003-2004 to 39 lakh bales in 2008-2009 and the productivity has also been increased from 372 to 545.7 kg/ha from almost the same area (Anonymous, 2009). In this zone approximately 10 per cent area is under *desi* (*G. arboreum*) cotton hybrids as well as varieties. In *desi* cotton, several GMS based hybrids with very high yield potential such as CICR 2, AAH 1, Moti are available for cultivation. The yield potential upto 40 q/ha has been picked from GMS based hybrid CICR 2 by several farmers. In addition to its shattering resistance and wilt tolerance properties, the area under *desi* cotton hybrids has not increased mainly because of non availability of good quality hybrid seed. As per estimate about 4575 q of *G. arboreum* hybrid seed is required annually for sowing in presently cultivated 1.22 lakh ha area. Keeping this in view the high yielding ability coupled with remunerative prices, there is a potential in increasing of *desi* cotton area under north zone especially after the availability of GMS based hybrids. The cotton hybrid seed production was earlier considered non profitable in north zone with conventional hybrids due to higher labour costs and this problem has been solved after the development of a number of GMS based *desi* cotton hybrids. The increasing demand of *desi*

farmers in this zone.

MATERIALS AND METHODS

The experiment on economics of hybrid seed production of *intra arboreum* GMS based hybrid CICR 2 (CISAA 2), was conducted for three consecutive years from 2006-2007, 2007-2008 and 2008-2009. Each year the experiment was conducted in 0.5 ac with female to male parent ratio of 4:1. The female parent was sown at 100 x 60 cm spacing whereas the male parent was sown at 67.5 x 60 cm spacing in the adjoining area. Recommended agronomic practices and plant protection measures were adopted for raising the healthy crop. The fertile plants were rouged out (2-3 inspections) at the time of flower initiation from 1:1 ratio of sterile and fertile plants in GMS based female parent. The hybridization was started with the onset of flowering around second week of August and continued daily till first week of October. Because of GMS property in its female parent, the labourers were employed only for pollination between 8.30 AM to 12.30 PM during crossing period and for pollination work in 0.5 ac area, 12 labourers were engaged for 4 h (half day) every day for 55 days, hence the total mandays considered were $660/2 = 330$ only. After pollination a thread was tied on pedicel of the crossed flower as a mark of identification which



Studies on stability parameters and sustainability index for selecting stable genotypes in Asiatic cotton (*Gossypium arboreum*)

S K VERMA¹, O P TUTEJA² and D MONGA³

Central Institute for Cotton Research, Regional Station, Sirsa 125 055

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ABSTRACT

Comparative studies on stability parameters and sustainability index for selecting stable genotypes in Asiatic cotton (*Gossypium arboreum* L.) was carried out according to Eberhart and Russell model with sustainability index model. Stability analysis was carried out on seven *Gossypium arboreum* genotypes for seed cotton yield, seed index, lint index, number of bolls/plant, boll weight, GOT, 2.5% span length, micronaire and bundle strength on three years data, viz. 2004, 2005 and 2006. Based on the linear component (bi), non-linear response (S^2di) and high mean performance (x), the genotypes LD 861 and CISA 614 were found stable for seed cotton yield. While based on sustainability index and best performance, the only genotype CISA 614 was found to be stable. For other traits like seed index, lint index, GOT, no. of bolls/plant, boll weight and micronaire, the deviation from regression was non-significant and on the basis of sustainability index, the variety CISA 614 was found stable having sustainability index more than 80%. For seed index, GOT, micronaire, 2.5% staple length, bundle strength, all the genotypes recorded very high sustainability index, which indicated that these characters are least influenced by the environmental factors, however, the genotype CISA 614 has high sustainability index for 2.5% span length, whereas very high sustainability index was expected. For many characters the results were found in conformity based on Eberhart and Russell model and hence the sustainability index model may be used for selecting the stable genotypes, however for 2.5% staple length it was found contrary.

Key words: Asiatic cotton, Stability parameters, Sustainability index, Yield

Seed cotton yield and its component traits are highly affected by environment. With the statistical and biometrical techniques developed to estimate stability parameters, it would be possible to determine genotypic response for wider adaptability. Techniques for GE analysis based on linear regression can be informative when GE interaction has high linear association with the environmental index but when the non-linear component is also significant (Finlay and Wilkinson 1963 and Verma *et al.* 2007). The analysis based on Eberhart and Russell model being relatively simple has been widely used for stability analysis. Estimation of GE interactions consists of complementary procedures of classification and grouping the genotypes according to their response in different environments (Nehra and Bhunia 2002 and Singh and Agarwal 2003). Genotype \times environment interaction is important in understanding the stability in yield of a particular genotype before it is being recommended for a given situation (Verma *et al.* 2008)

The present investigation was therefore conducted to find out the stability for seed cotton yield and its component traits of promising arboreum genotypes and to compare model of Eberhart and Russell and the new model based on sustainability index used by other workers in cotton (Verma *et al.* 2007 and Tuteja 2006).

MATERIALS AND METHODS

The experimental material consisted of 6 promising high yielding Asiatic cotton (*Gossypium arboreum* L.) genotypes namely FDK103, LD 866, LD 816, CISA 310, CISA 614 and HD 402 representing north zone, i.e. Faridkot, Ludhiana, Sirsa and Hisar and one cheek variety, i.e. HD 123. These genotypes were grown in a randomized block design with three replications during *kharif* season of 2004, 2005 and 2006. The plot size was 6.0 m \times 2.7 m with four rows spaced 67.5 cm apart in each environment namely, Faridkot, Ludhiana, Sirsa and Hisar and plant to plant spacing of 30cm. The data were recorded on seed cotton yield (kg/ha), lint yield (kg/ha), number of bolls/plant, boll weight (g), GOT (ginning outturn), seed index, lint index, quality traits like 2.5% span length (mm), micronaire and bundle strength (g/tex). The seed cotton yield was recorded on plot basis and

¹ Senior Scientist (e mail: surenderkumar64@yahoo.co.in),
² Principal Scientist (e mail: optuteja2001@yahoo.co.in) and ³ Head and Principal Scientist (e mail: dmonga2009@gmail.com)

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Studies to enhance cotton plant stand under north zone

R A MEENA*, D MONGA AND NEHA

Central Institute for Cotton Research, Regional Station, Sirsa - 125 055

E-mail : rameenacotton@rediffmail.com

ABSTRACT : Experiments were carried out at Central Institute for Cotton Research, Regional Station, Sirsa during 2006 to 2009 to find out the contribution of transplanting of raised seedling, seed lot with superior seed index and pre sowing seed treatments to enhance the plant stand in field under adverse conditions during seedling stage in northern cotton growing zone of India. The transplanting of advance raised seedlings greatly contributed towards enhanced plant stand up to 97.0 per cent with yield 31.7 q/ha than normal sown crop with plant stand of 85 per cent and yield 25.1q/ha. Because of higher yield with transplanted crop the net income Rs. 6108/ha over normal sown crop was observed. The superior seed index also contributed significantly in improving plant stand and up to 89.8 per cent plant stand and yield more than 33.0 q/ha in *G. hirsutum* and plant stand 87.2 per cent with 32.6q/ha yield in *G. arboreum* was observed with use of graded seed lot having seed with superior seed index as compared to ungraded seed lot with plant stand 70.6 per cent and yield of 28.2 q/ha in *G. hirsutum* and plant stand 75.9 per cent with yield 28.2 q in *G. arboreum* species. Treated seed with KNO_3 100 mM + Imidacloprid + Vitavax showed the higher plant stand upto 87.6 per cent in *G. hirsutum* and 82.2 per cent in *G. arboreum* followed by DAP 1 per cent + Imidacloprid + Vitavax (85.7% and 79.4%) against the control (82.5%).

Keywords: Cotton seedling enhancement, transplanting, seed index, seed treatment

Cotton is the most important commercial crop which contributes nearly 65 per cent raw material for textile industry. After the introduction of *Bt* cotton, the production increased from 179 lakh bales in 2003 to 315 lakh bales during 2007-2008 but after that it started declining and was 290 lakh bales in 2008 and 295 in 2009. The productivity also declined from 560 kg/ha in 2007 to 526 kg/ha in 2008 and 496 kg/ha in 2009. The northern cotton growing zone of the country is an important zone in which cotton was grown in 15 lakh ha area and contributed 39 lakh bales during 2009-2010 which is about 13 per cent of total production of country. In this zone almost entire cotton area is covered under *Bt* hybrids except about 10 per cent under *G. arboreum* and *G. hirsutum* varieties and hybrids. The poor plant stand due to soil/water salinity/alkalinity, crust formation due to rains just after sowing and mortality of seedlings under high temperature condition during sowing season is a serious problem and cause heavy loss in yield. The higher seed rate also cannot be advised to farmers as the cost of *Bt* seed is much higher than open pollinated varieties. Ensuring optimum plant stand under prevailing condition is a biggest challenge to the cotton researchers. The literature indicated that the improved physiological properties such as superior seed

index and pre sowing seed treatments act as catalyst to improve survival rate under such adverse field situations (Lather *et al.*, 1992; Meena and Deshmukh., 1990). The current study was carried out with the aim to evaluate the contribution of seed physiological properties and also of seedling transplanting for enhancing the plant stand under north zone.

MATERIALS AND METHODS

The field experiments were carried out at Central Institute for Cotton Research Regional Station, Sirsa during 2006 to 2009. The contribution of transplanting of raised seedling, seed index and pre sowing seed treatments was assessed to achieve optimum plant stand in field condition. To assess the contribution of transplanted crop, seedlings of *Bt* hybrids RCH 134 were raised in disposable cups of different height i.e. 4.5, 6.5 and 8.5cm with same diameter in the substratum made by mixing the coir pit, FYM and soil in the ratio of 50 : 35 : 15. In addition to that the seedling raised using saw dust, FYM and soil with 20 days seedlings was also compared as saw dust is easily available material for the farmers. The evaluation was made against two controls, first was the normal sowing on the date of raising of 20 days old seedlings in cups and second was

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Editors : Dr. J. Annie Sheeba, Dr. Vishlesh Nagrare, Dr. J. Amudha, Dr. M. Saravanan

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Post Bag No. 2, Shankar Nagar PO, Nagpur 440010

Phone : 07103-275536 Fax : 07103-275529; email: cicrnagpur@gmail.com