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# FRONT LINE DEMONSTRATION TO POPULARIZE INTEGRATED PEST MANAGEMENT IN COTTON (*Gossypium*) AMONG FARMERS OF SIROHI DISTRICT, RAJASTHAN

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**Abstract:** Cotton is most important cash, commercial and fibre crop of the country, providing direct livelihood to the cotton growers. The development of the agriculture is primarily the application of the science and technology by making best use of available resources. One of the drawbacks in tradition is excessive use of pesticide by the farmers and non-adoption of package of practices. To replace this anomaly, Krishi Vigyan Kendra, Sirohi conducted front line demonstration on integrated pest management at forty adopted farmer's field. During the study, it was observed that in Integrated pest management front line demonstration increased seed cotton yield (2302 kg/ha) as compared to farmer practice (1995 kg/ha) as well as IPM FLD also reduce the excessive use of pesticide, increased bio-agent population and reduction in sucking insect population.

**Keywords:** Cotton, Front Line Demonstration, Integrated pest management, Technology gap, Technology index, Extension gap.

## INTRODUCTION

The Indian council of Agricultural Research started front liner demonstration during Kharif 1995 in All India Coordinated Cotton Improvement Project Centres. Several demonstration are being conducted for popularisation of released and pre released varieties and hybrids with improved agronomic and crop protection techniques of cotton. This project also involves in organizing extension programmes for disseminating the recent agricultural technologies to the farmer's field. Frontline demonstration may play a very important role in proper transfer of technologies and changing scientific temperament of farmers. Frontline demonstration is the new concept of field demonstration evolved by the Indian council of agricultural Research with inception of the technology mission on oilseeds crops during mid-eighties. The main objective of front line demonstration is to demonstrate newly released crop production and protection technologies and its management practices in the farmer's field under different agro-climatic regions and farming situations. Front line demonstration are conducted in a

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block of 20 hectares land in order to have better impact of the demonstrated technologies on the farmers and field level extension functionaries. The agriculture technology is not generally accepted by the farmers completely in all respect. As such there always appear to be a gap between the recommended technology by the scientist and its modified form of as farmer's levels. The technology gap is thus the major problem in the efforts of increasing agricultural production in the country a need of the day is to reduce the technological gap between the agricultural technology recommended by the scientist and its acceptance by the farmers at field level. In view the farmer using excessive pesticide and improper manner, front line demonstration were undertaken to show the worth of integrated pest management and convenience them to adopt improve cultivation practices of cotton for enhancing production and reduction in pesticide application. Keeping in view the present investigation attempts to study the yield gap, pesticide use, population of natural enemies and sucking pest population between IPM FLD and Non farmers practices and benefit cost ratio.

**RESEARCH METHODOLOGY**

The FLD on IPM was conducted at 40 farmers' field of village Kachholi, Panchayat Samiti Pindwarain Sirohi district. The data on yield gap, pesticide use, population of natural enemies and sucking pest population was recorded as observation. The data on output and input used in IPM FLD and Farmer Practices were collected by KVK Sirohi. All 40 participating farmers were trained on various aspects of cotton production technologies. Recommended agronomic practices and genuine seed of cotton variety Cot-33 @ 2.5 kg per ha was used for FLD in 20 ha area (0.5 ha per demonstration) and recommended pesticide provided in FLD and 20 ha area were kept as Non-IPM (Farmers Practice).

The difference between IPM FLD and farmer practice is given in Table 1 and difference between plant protection major is given in Table 2. The data on sucking pest population, bio-agent population and output were collected from both IPM FLD Plot as well as farmer practice and finally the extension gap, technology gap, technology index along with benefit cost ratio were worked out (Samui *et al*., 2000) as given below

Technology gap= Potential yield - demonstration yield

Extension gap = Demonstration yields - Farmers yield

Technology index = (Technology gapX100)/ Potential yield

**Table1.** Comparison between agronomic practices of IPM FLD and Non IPM Framers Practices in cotton crop

| S. No. | Particular | IPM FLD | Farmer practice |
|---|---|---|---|
| 1 | Farming Situation | Irrigated | Irrigated |
| 2 | Variety | Cot-33 | Cot-33 |
| 3 | Time of sowing | Last week of May to June end | Last week of May to June end |
| 4 | Type of Soil | Clay loam | Clay loam |
| 5 | Seed treatment | Imidaclopride 7g per kg seed | Imidaclopride 7g per kg seed |
| 6 | Seed Rate | 2.5 kg per ha | 2.5 kg per ha |
| 7 | Fertilizer application | N-80kg, P-90Kg | N-85kg, P-95Kg |
| 8 | Cost of pesticide | Rs.1100 per ha | Rs.2800 per ha |

**Table 2.** Comparison between plant protection measure IPM FLD and Non IPM Framers Practices in cotton crop

| No. of Spray | Stage of crop | IPM FLD | | Farmer Practice* | |
|---|---|---|---|---|---|
| | | Types of pesticide and Botanicals / Bio-agents | Time of application | Types of pesticide and Botanicals / Bio-agents | Time of application |
| 1st | Vegetative | 5 % Neem leaf extract | 15.07.09 | Imidaclopride 250 ml per ha | 20.07.09 |
| 2nd | Vegetative | Imidaclopride 200 ml per ha | 05.08.09 | Imidaclopride 500 ml per ha or Quanolphos 1 litre + Profenophos 1.25litre + Dichlorovos 300ml | 10.08.09 |
| 3rd | Vegetative | Methyl demotone 600 ml per ha | 28.08.09 | Cypermethrin 650 ml or Imdaclopride 500 ml + Profenophose 1.25 litre or Dithane M-45 1.5 kg per ha | 25.08.09 |
| 4th | Flower initiation | 5 % Neem Leaf Spray | 06.09.09 | Cypermethrin 650 ml or Acetapremide 250 g | 10.09.09 |
| 5th | Boll formation | | | Imdaclopride 500 ml + Profenophose 1.25litre | 25.09.09 |

*Data of from non IPM Farmer were collected by personal interview.

## RESULT AND DISCUSSION

*Use of pesticide:*

A comparison between IPM FLD and farmer practice for use of pesticide given in Table 2 show that the farmers used higher dosages of insecticide and one extra spray with advice of local input dealer. The farmer convinced about the proper dosage of insecticide by IPM FLD. It reduces the environmental pollution due to pesticide as well as reduce the cost of cultivation by Rs. 1700 per ha in Table 1.

*Pest population:*

The sucking pest like white fly, Jassid, aphids, grey weevil and thrips were count on 100 leaves after every spray given in Table 3. It was observed that the population of sucking pest was less in IPM FLD fields as compared to farmer's practices. It might be due to the quantity of solution was use required level with recommended concentration in IPM FLD while in farmers practice farmers used non-uniform spays of low spray solution with high concentration of pesticides.

**Table 3.** Comparison between plant protection measure IPM FLD and Framers Practices in cotton crop

| Pests | Date of appearance (DAS) | Stage of crop | Type and nature of damage | Incidence /100 leaf | |
|---|---|---|---|---|---|
| | | | | IPM FLD | FP |
| White fly | 45-120 | Vegetative | Sucking | 276 | 379 |
| Jassid | 40-100 | Vegetative | Sucking | 245 | 299 |
| Aphid | 35-75 | Vegetative | Sucking | 225 | 312 |
| Grey weevil | 75-125 | Flowering | foliage feeder | 130 | 205 |
| Thrips | 75-110 | Square initiation | Cell Sucking | 332 | 374 |

*Population of natural bio-agent*

The population of two natural bio-agent namely lady bird beetle, and spider was recorded in both IPM FLD and farmer practices. It was observed that both bio-agent population was more in IPM Fields as compare to Farmer practice. It may be due to use of recommended dosages of pesticide with proper quantity of spray solution in IPM field while in Farmer practice farmer used higher concentration with low quantity of spay solution.

**Table 4.** Comparison between natural bio-agent population in IPM FLD and Framers Practices in cotton crop

| Category | No. of Spray | Population before Pesticides Application per 100 plant | | Population after pesticides Application per 100 plant | |
|---|---|---|---|---|---|
| | | Lady Bird beetle | Spider | Lady Bird beetle | Spider |
| IPM | 1st | 4 | 4 | 4 | 3 |
| | 2nd | 6 | 7 | 6 | 6 |
| | 3rd | 7 | 8 | 5 | 5 |
| | 4th | 8 | 9 | 6 | 7 |
| Farmer practice | 1st | 2 | 3 | 1 | 2 |
| | 2nd | 2 | 3 | 2 | 1 |
| | 3rd | 4 | 6 | 3 | 4 |
| | 4th | 4 | 2 | 3 | 2 |
| | 5th | 2 | 1 | 2 | 1 |

Other intervention: among other intervention IPM farmers sown maize crop row as intercrop (6 row Bt. with 1 row maize) and used local light trap which is not followed by the farmers in their practice.

*Yield:* A comparison of productivity levels between IPM FLD and farmers practice is shown in Table 5. It was observed that in IPM FLD higher seed cotton yield (2302 kg per ha) as compared to farmer practice (1995 kg per ha). The percent increase in the yield over farmer practice was 15.40 %. Similar yield enhancement in different crops in FLD has amply been documented by Hiremath *et al.* (2007), Mishra *et al.* (2009), Kumar *et al.*(2010), Kumar *et al.*(2010), Dhaka *et al.* (2010) and Patel *et al.* (2013). The results indicate that the increase in yield may be due to proper application of pesticide and low in farmer practice may be due to spray of pesticide at flowering stage which lead flowers drop. Farmer were motivated to adopt the plant protection measures applied in the IPM FLDs fields and it is adopted by the farmer and using practice because less use of pesticide save the money. Yield of IPM FLD and potential yield of the crop was compared to estimate the yield gap which were further categorized into technology index.

**Table 5:** Yield, technology gape, and technology index of demonstration.

| Category | Yield (Kg/ha) | Increase (%) over local check | Technology gap (kg/ ha) | Technology index (%) |
|---|---|---|---|---|
| IPM FLD | 2302 | 15.40 | 248 | 9.72 |
| Farmer practice | 1995 | - | - | - |

*Technology gap:*

The technology gap shows in Table 5 the gap in the IPM FLD yield in comparison to potential yield and it was 248 kg / ha. The IPM FLDs were laid down under the supervision

of KVK Scientists at the farmer's field. This may be due to the soil fertility and weather conditions. These findings are similar to the finding of Sharma and Sharma (2004).

*Technology index:*

Technology index shows the feasibility of the technology at farmer's field. The lower value of the technology index indicate more feasibility. Results of study depicted in Table 5 revealed the technology index value was 9.72. The result of present study are in accordance of results of Singh *et al.* (2007), Hiremath and Nagaraju (2009) and Patel *et al.* (2013).

**Table 6.** Economic of IPM front line demonstration.

| Category | Cost of Cultivation (Rs) * | Gross return (Rs) * | Net Return (Rs) * | B:C |
|---|---|---|---|---|
| IPM | 19410 | 78268 | 58858 | 3.03 |
| Farmer practice | 22150 | 66830 | 44680 | 2.01 |
| Additional in IPM FLD | -2740 | 11438 | 14178 | |

* Average of 40 famers

*Economics of IPM FLD*

The economics of cotton production under IPM FLD were calculated and the results shown in Table 6 the result of economic analysis of cotton production revealed that IPM FLD recorded reduction in cost of cultivation (Rs.19410 per ha) as compared to farmer practice cost of cultivation (Rs.22150 per ha) and higher gross return (Rs.78268) with higher benefit ratio (3.03) as compared to farmers practice. The result in consonance with findings of Hiremath *et al*. (2007), Hiremath and Nagaraju (2009) and Patel *et al.* (2013). Further, the cost of cultivation is reduced by Rs.2740 per ha as well as increased additional return Rs.14178 per ha showed it higher profitability and economic viability of IPM FLD.

## CONCLUSION

The finding of the IPM FLD revealed that wide gap was observed between potential and demonstration yield due to technology and extension gap in Sirohi district of Rajasthan. By conducting IPM FLD of proven technologies yield potential can be increased to a great extent with reduction in non-judicious use pesticide, saving of natural bio-agent lead to ecological balance. This will substantially increase in income, reduce pesticide environmental pollution and resistance against pesticide as well as improve the livelihood of farming community. There is need to adopt prolonged strategy that involve enhancing cotton production through improved technologies in Sirohi district of Rajasthan. The study emphasizes the need to educate the farmers for adopting the improve technology to narrow the technological gap through various technology transfer centres.

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