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Research Article

Role of Krishi Vigyan Kendra in the intensification of sunflower

■ **AFZAL AHMAD, UPASANA SINGH AND GURU PREM**

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SUMMARY : Front line demonstration (FLD) is one of the most powerful tools for transfer of technology. Keeping in view of an effective extension approach of FLDs for dissemination of sunflower technology, FLDs on sunflower were conducted in differerent villages of Ambala district in Haryana during 1996-97 to 2010-11 at farmers' fields. Sunflower holds great promise as an oilseed crop because of its short duration, healthy oil quality, photo-insensitivity and wide adaptability to different agro-climatic region and soil types. The sunflower gives comparative higher productivity in spring season (zaid season), therefore it is mainly cultivated in spring season in Ambala district. Through FLDs on sunflower, different technologies like use of seed drill, use of single super phosphate (SSP) in place of diammonium phosphate (DAP), application of micronutrients, adoption of timely plant protection measures, application of gypsum as a source of sulphur were popularized and all these technologies gave higher yield as compared to farmer's practices where no such technologies were adopted.

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KEY WORDS:
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Author for correspondence :
AFZAL AHMAD
Department of Agronomy, Krishi Vigyan Kendra, Teple, AMBALA (HARYANA) INDIA
Email: afzal_ahmad76@yahoo.com

See end of the article for authors' affiliations

BACKGROUND AND OBJECTIVES

Sunflower (*Helianthus annuus* L.) is one of the most popular sources of vegetable oil. It is cultivated on an area of 27.3 million hectares with an annual production and productivity of 26.46 million tonnes and 914 kg per hectare, respectively in the world. In India, sunflower is cultivated over an area of about 2 million hectares with a production of 1.18 million tonnes and productivity of 590 kg per hectare (Anonymous, 2006). The average productivity of sunflower in India is very low (approx. 600 kg/ha) to world average of (approx. 900 kg/ha). India being deficient in oils, it has to import 40% of its consumption requirements. With an annual consumption of about 11 million tonnes, the per capita consumption is at 11.50 kg, which is very low as compared to world average of 20 kg (*www.mofpi.nic.in*).

The improvement in the yield and the increase in the area of sunflower cultivation will reduce the dependence of importing edible oils for domestic consumption. Sunflower best suits to different climatic conditions, with changes of area expansion and horizontal intensification for improving oil seed production in India. The sunflower yield can be increased from 1.5-2.0 t/ha by adopting improved production technology. Thus, there is a gap of 0.8 to 1.2 t/ha on yield recorded in between improved agronomic practices and farmers' field (Yadav *et.al.,* 2009).

Due to better production capacity and higher minimum support price (MSP) by the government, it is becoming popular year-by-year among the farmers of Haryana. Kurushhetra, Ambala, Yamuna Nagar and Karnal are the main sunflower growing districts of Hrayana. The area and productivity of sunflower in Ambala district is very low (approx. 650 kg/ha) as compared to state acreage and state productivity (1750 kg/ha). Therefore, it is very essential to demonstrate the high yielding varieties, which are resistant to biotic and abiotic stresses and other production technologies, which the farmers generally do not adopt. Recognising the importance of sunflower as an oilseed crop, the Ministry of Agriculture, Government of India has taken initiative to boost the production of sunflower through front line demonstrations (FLDs). Front line demonstration

(FLD) is the new concept of field demonstration evolved by the Indian Council of Agricultural Research (ICAR) with the inception of the technology mission on oilseed crops during mid-eighties. The field demonstrations conducted under the close supervision of scientists of the National Agriculture Research System (NARS) is called Front line demonstration because the technologies are demonstrated for the first time by the scientists themselves before being fed into the main extension system of the State Department of Agriculture. Front line demonstration is one of the most powerful tools of extension because farmers in general, are driven by the perception that "seeing is believing".

The main objective of frontline demonstrations 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. While demonstrating the technologies in the farmer's field, the scientists are required to study the factor contributing higher crop production, field constraints of production and thereby generate production data and feedback information. Frontline demonstrations are conducted in a block of two or four hectares land in order to have better impact of the demonstrated technologies on the farmers and field level extension functionaries (Sharma *et al*, 2011). Keeping in view the importance of FLDs, the Krishi Vigyan Kendra (KVK), Ambala conducted demonstrations on sunflower at farmers' field under irrigated situations in *Zaid* season from 1996-97 to 2010-11. The objectives of the study were to exhibit the performance of recommended high yielding varieties of sunflower, to popularize secondary and micronutrients to enhance the productivity and quality of sunflower, to compare the yield of local check (farmers' field) and FLD fields, to popularize the application of single super phosphate (SSP) in sunflower crops and to exhibit the benefits of plant protection measure on time.

RESOURCES AND METHODS

The FLDs on sunflower were conducted in different villages of Ambala district from 1996-97 to 2010-11 at farmers' fields. For conducting demonstrations on sunflower, farmers were selected from all three categories *i.e.* large (with more than 4 ha. of land), medium (with 2-4 ha. of land) and small and marginal (with less than 2 ha. of land). The agriculture development officers (A.D.Os) of agriculture department and progressive farmers were consulted at the time of selection of farmers and area. Most of the demonstrations were conducted under the irrigated farming situation. The KVK scientists visited the FLD plots regularly on different crop critical stages to ensure timely application of nutrients and plant protection measures and also to give proper advise to farmers. These visits were also utilized to collect the feedback information for further improvement in research and extension programmes. Field days and group meetings were also organized at the demonstration sites to provide opportunities for other farmers to observe and witness the benefits of demonstrated technologies. The critical inputs were duly supplied to the farmers by the KVK, Ambala. Data were collected from the FLDs farmers and analysed with the suitable statistical tools to compare the yield of farmers' fields and FLD fields.

OBSERVATIONS AND ANALYSIS

The progress of FLDs on sunflower from 1996-97 to 2010-11 is presented in Table 1. Since the inception of KVK, Ambala in 1996, the FLDs on sunflower have been conducted to demonstrate different production boosting technologies. The different production enhancing technologies were:

Use of seed drill :

In Ambala district, generally the farmers broadcast the sunflower seed for sowing, which leads to poor germination and crop growth due to overlapping of seeds. Line sowing ensures timely sowing and labour saving and also facilitated easy inter-cultural operations like irrigation, weeding, fertilizer application, insecticides and herbicides application etc. Through FLDs, they were convinced that line sowing of sunflower using seed drill on bund keeping certain line-to-line and plant-to-plant spacing gives better results as compared to broadcasting method of sowing. Table 1 revealed that during the years 1996-97 and 2004-05, the average yields were 17.00 qt/ha and 23.76 q/ha, respectively in the FLD plots and increase in yields were 0.77 per cent and 4.16 per cent, respectively. In the year 2008-09, line sowing did not give good results as compared to local check because the variety (Kranti-999) used in the FLD plots were spurious and duplicate and seeds of that variety could not germinate well. Therefore, the average yield of FLD plots was 13.31 q/ha whereas, it was 17.86 q/ha in case of local check plots. This accounted for negative 25.47 per cent increase in yield over local check plots.

Use of single super phosphate (SSP) :

In Ambala district of Haryana, most of the farmers generally apply dia ammonium phosphate (DAP) in place of SSP due to low or no availability of SSP and lack of awareness and knowledge on importance of SSP among the farmers. For oilseed crops like sunflower, toria, mustard etc. SSP is considered and recommended because it is the master nutrient for the oilseed crops. The SSP contains major nutrient phosphorus (16%) and secondary nutrient sulphur (12%) and traces of magnesium. Sulphur is essential for the synthesis of certain amino acids and oils and it also hastens root growth and stimulate seed formation in oil seed crops (Das, 1999). General use of DAP by the farmers is creating deficiency of

secondary nutrients like sulphur in the soils of Ambala district, because DAP lacks in secondary nutrient sulphur (S). Benefits of SSP in sunflower were demonstrated through FLDs during the years 1997-98 to 2001-02 and again in 2004-05, 2005-06 and 2007-08. In all these years, it was observed that the yields in FLD plots were higher as compared to local check plots.

Application of micronutrients :

Use of high-grade chemical fertilizers like urea, DAP, muriate of potash (MOP) etc. and no or less use of compost, farm yard manure (FYM), crop residues etc. have created deficiency of micronutrients such as zinc (Zn), iron (Fe), manganese (Mn) etc. in the fields of Ambala district as proved and confirmed by the soil test reports. These micronutrients are required in very low amount but they are very essential for the growth and production of crops. Micronutrients help in proper seed setting in sunflower. One of the reasons for wide gap between national and global level productivity is due to poor seed setting and high per cent of chaffy seeds in the centre of the capitulum (Chowdhury *et al.*, 2010). Table 1 indicated that application of micronutrients like manganese (Mn) in the sunflower FLDs increased the yield of sunflower during the years 2002-03 and 2006-07. During the year 2002-03, the average yield of FLD plots was 22.56 q/ha and under local check was 20.50 q/ha. The percentage increase in yield over local check was 10.04. It may be noted that no micronutrient was applied in local check plots. 15.43 q/ha average yield of FLD plots was observed during the year 2006-07 whereas the average yield of local check was 13.41 q/ha. This accounted for 15.06 per cent increase in yield over farmers' practice plots where no micronutrient was used.

Plant protection measures :

Most of sunflower growing farmers of Ambala do not use proper dose of insecticides, proper amount of water for spraying pesticides, suitable nozzle for spraying, appropriate time and growth stage of crops for applying pesticides. All these factors lead to low yield of sunflower. Keeping in view the above mentioned problems, FLDs on sunflower were conducted at farmers' fields to demonstrate the correct plant protection measures from 1996-97 to 1999-2000 and again in 2001-02 in combination with other production boosting technologies like use of SSP, seed drill and application of MOP. Every year, the yield of FLD plots was higher as compared to local check.

Application of gypsum :

During the years 2006-07 and 2007-08, FLDs on sunflower were conducted using gypsum along with application of micronutrient such as manganese (Mn) and high-grade chemical fertilizer SSP, respectively (Table 1). Before conducting FLDs, soil samples were collected from the selected fields and

Table 1: Performances of sunflower under FLDs from 1996-97 to 2010-11

Year	No. of FLDs	Area (hac.)	Varieties		Technology demonstrated	Average yield (q/ha)		% increase in yield
			Demo	Local		Demo	Local	
1996-97	8	3.2	MHSH-8 and PHC-8699	PHC-8699	HYVs, seed drill and plant protection	17.00	16.87	0.77
1997-98	13	5.2	PHC-3068, Sunstar and Jawalamukhi	PHC-3068	Use of SSP and plant protection	14.43	10.95	24.11
1998-99	11	4.4	Pioneer 6460 and Marphero-8	Pioneer 6460	Use of SSP and insecticide	18.50	17.50	5.71
1999-00	13	5.0	Pioneer 6460 and Jawalamukhi	Pioneer 6460 and Jawalamukhi	Use of SSP and insecticide	15.00	12.50	20.00
2000-01	12	5.0	Pioneer 6460	Pioneer 6460	Use of SSP and MOP	21.52	19.21	11.61
2001-02	12	5.2	Advanta PAC 3068 and Pioneer 6460	Marphero-8 and PHC-7/seneca	Use of SSP and insecticide	15.68	13.75	21.39
2002-03	20	8.0	Pioneer 6460	Pioneer 6460	Use of micronutrients (Mn)	22.56	20.50	10.04
2003-04	2	1.2	JK Chiraj	Vibha & Pioneer 6460	Seed treatment	21.25	18.33	15.93
2004-05	25	10.0	Pioneer 6460 and Pioneer 64A37	Pioneer 64A37	Line sowing and use of SSP	23.46	22.81	4.16
2005-06	25	10.0	Pioneer 6460	Pioneer 6460	Use of SSP and MOP	17.50	16.00	9.31
2006-07	25	10.0	Pioneer 6460 and Sunbred 275	Pioneer 6460	Use of micronutrients (Mn) and gypsum	15.43	13.41	15.06
2007-08	18	7.4	Sunbred 275	Pioneer 6440	Use of SSP and gypsum	21.40	19.25	11.16
2008-09	15	6.0	Kranti 999	Pioneer 6440	HYVs and line sowing	13.31	17.86	-25.47*
2009-10	15	6.0	PSH-569	Pioneer 64A99	HYVs	12.00	18.75	-36.00*
2010-11	15	6.0	Pioneer 64A37	Pioneer 64A37	Use of potash and magnessium	19.25	16.25	18.46

* Less yield due to (a) Kranti 999 variety was duplicate and did not germinate well (b) PSH-569 was found to be unsuitable for climatic conditions of Ambala district.

were sent to soil and water Testing Laboratory (Ambala) for soil analysis. Soil analysis report indicated pH of soil was more than 8.5. On the recommendation of soil testing officer, Department of Agriculture (Ambala), gypsum was applied in the field and it was observed that the yield was higher in the fields where gypsum was used whereas yield was low in the plots where gypsum was not applied. As gypsum also contains 18% sulphur, therefore indirectly it supply the sulphur to the crop and increases the productivity of the crop.

The data in the Table 1 also showed that during the year 2009-10, the average yield of FLD plots, where hybrid variety PSH-569 was used, was low. The reason was that this variety PSH-569 was not suitable for the climatic conditions of Ambala, although it gave good results in the climatic conditions of Punjab. It may be noted that PSH-569 has been released by Punjab Agricutlural University, Ludhiana (Punjab) for the cultivation in Punjab region.

Conclusion:

– The yield from demonstrated plots was higher than local-check plots in all the years except 2008-09 and 2009-10.

– There is need of short duration high yielding university-released varieties for Haryana region as most of the varieties used by farmers are private seed companies varieties which are costly and sometimes spurious and duplicate.

– As the feedback of farmers was collected, it was observed that Blue-Bull (Neelgai) was the major obstacle in the expansion of sunflower area in the district of Ambala although farmers were keen to diversify from the main rice-wheat crop rotation of the district, as it is proving disastrous for ground water level. There is need to control the menace of Blue-Bull.

Authors' affiliations :

UPASANA SINGH, Krishi Vigyan Kendra, Teple, AMBALA (HARYANA) INDIA

GURU PREM, Department of Agricultural Engineering, Krishi Vigyan Kendra, Teple, AMBALA (HARYANA) INDIA

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