Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(1): 1170-1172
Received: 15-11-2018
Accepted: 20-12-2018

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Impact and assessment of high yielding variety PSM-3 of pea through on farm testing in Sidhi and Hoshangabad district of Madhya Pradesh

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Abstract
Powarkheda Hoshangabad is located at 22.75°N 77.72°E. on the banks of Tawa and Narmada rivers and Sidhi is situated in Kaymore plateau and satpura hillsh of Madhya Pradesh. Pea is one of the major rabi season vegetable in district. Krishi Vigyan Kendra laid down On Farm Testing Demonstration in the year 2011-12 and 2016-17 introducing new, high yielding variety PSM-3. The OFT were carried out in village Sangakheda district Hoshangabad and village Mamdar in sidhi district in supervision of KVK. The productivity and economic returns of pea in recommended package and practice were calculated and compared with the corresponding farmer's practices (local check). Improved practices recorded higher yield as compared to farmer's practices. The improved technology recorded higher yield of 80 q/ha and 70 q/ha in the year 2011-12 and 2016-17, respectively than 65 and 50 q/ha. The average yield increase was observed 31.53 percent In spite of increase in yield of pea, technology gap, extension gap and technology index existed. The improved technology gave higher gross return (160,000 & 140,000 Rs./ha), net return (92,000 & 72,000 Rs./ha) with higher benefit cost ratio (2.35 & 2.06) as compared to farmer's practices. The variation in per cent increase in the yield was found due to the poor management practices, lack of knowledge and poor socio economic condition. Under sustainable agricultural practices, with this study it is concluded that the OFTs programmes were effective in changing attitude, skill and knowledge of improved package and practices of pea adoption.

Keywords: Pea, OFTs, Economic impact, Adoption, B:C ratio

Introduction
Pea (*Pisum sativum* L.2n=2x=14) also known as "garden pea" or matar belongs to family Leguminaceae (Fabaceae) is one of the important vegetables grown winter season throughout the India. It has a prominent place in human diet Pea is highly nutritive and rich source of protein and carbohydrate with mineral and vitamins. Each 100 g edible portion of pea contains protein 7.2 g, Carbohydrate 15.9 g, Calcium 20 mg, Phosphorus 139 mg Energy 93 K cal, Fiber 4.0 g. In Madhya Pradesh pea is covering an area 483 thousand ha with 4650 thousand MT (NHB 2015-16) [4]. Selection of proper and HYV and scientific agronomic practices play a vital role in increasing productivity. The major factors, which contribute to the crop yield, include; use of improved cultivars, balanced nutrition and cultural practices. If the crop is managed properly, green pods are produced continuously for several months. Use of STV based Balance fertilizer enhances the root growth but also promotes early plant maturity.

Krishi Vigyan Kendra an innovative science based institution plays an important role in bringing the research scientists face to face with farmers. The main aim of Krishi Vigyan Kendra is to reduce the time lag between generation of technology at the research institution and its transfer to the farmers for increasing productivity and income from the agriculture and allied sectors on sustained basis. KVKs are grass root level organizations meant for application of technology through assessment, refinement and demonstration of proven technologies under different micro farming situation at district (Das, 2007) [1]. On Farm testing (OFT) is to assess the location specificity of agricultural technologies under various farming systems of new practices/ technology. Farmers in India are still producing crops based on the knowledge transmitted to them by their forefathers leading to a grossly unscientific agronomic, nutrient management and pest management practices. As a result of these, they often fail to achieve the desired potential yield of various crops and new varieties. The baseline survey was conducted by Krishi Vigyan Kebdra and it was found that farmers were using old varieties without any proper scientific approach like use of locally available old variety without proper distance no seed treatment, imbalance use of fertilizer Keeping in view the constraint, Krishi Vigyan Kendra, Sidhi & Hoshangabad conducted On Farm Testing (OFT) on Pea variety PSM-3 with crop management practices under irrigated situation.

Materials and methods

On Farm Testing (OFTs) on pea variety PSM-3 were conducted by Krishi Vigya Kendra, Sidhi (M.P.) during the period 2011-12 in village Mamdar and 2016-17 in village Sangakheda of district Hoshangabad. The total 10 number of demonstration was conducted in these village. In general soil of the area under study was sandy loam with low to medium fertility status and black cotton soil with low to medium fertility status. The component demonstration of On Farm Testing in pea was comprised i.e. improved variety PSM-3, seed rate and sowing method, balance dose of fertilizer (20-30:50-60:50 (N:P:K)), use of PSB @ of 5g/kg of seed and @Rhizobium 250g/10 Kg of seed as seed treatment, proper irrigation, weed management and protection measure (Table-1). The total 04 ha area was covered in two consecutive years. In the demonstration, one control plot was also kept where farmers practices was carried out. The OFTs was conducted to study the technology gap between the potential yield and demonstrated yield, extension gap between demonstrated yield and yield under existing practice and technology index. The yield data were collected from both the demonstration and farmers practice by random crop cutting method and analyzed by using simple statistical tools. The technology gap, extension gap and technological index (Samui *et. al*., 2000) [5] were calculated by using following formula as given below-

$$\text{Percent increase yield} = \frac{\text{Demonstration yield-farmers yield}}{\text{Farmers yield}} \times 100$$

Technology gap= Potential yield-Demonstrated yield

Extension gap= Demonstrated yield – Yield under existing practice

$$\text{Technology index} = \frac{\text{Potential yield - Demonstrated yield}}{\text{Potential yield}} \times 100$$

Results and discussion

The gap between the existing and recommended technologies of pea in district Sidhi and Hoshangabad were presented in table-1 & 3. Full gap was observed in case of method of sowing, seed treatment, Fertilizer dose, plant protection and weed management and partial gap was observed, in HYV, time of sowing and seed rate, which definitely the reasons of not achieving potential yield were. Farmers were not aware about recommended technologies. Farmers in general used degenerated seeds of local varieties instead of the recommended high yielding resistant varieties. Unavailability of seed in time and lack of awareness were the main reasons. Farmers followed broadcast method of sowing against the recommended line sowing with proper spacing and because of this, they applied higher seed rate than the recommended.

Yield and yield attributes

During two years of frontier technologies results obtained are presented in table-2. The results revealed that the OFTs on pea an average yield was recorded 75 q/ha.under demonstrated plots as compare to farmers practice 57.5 q/ha. The highest yield in the OFTs plot was 80 q/ha during 2011-12 and in farmers practice 65 q/ha during 2011-12. This results clearly indicated that the higher average yield in demonstration plots over the years compare to local check due to knowledge and adoption of full package of practices i.e. appropriate varieties such as PSM-3, timely sowing, proper spacing, seed treatment with *PSB* @ 5g/kg of seed, Rhizobium @250 g /10 Kg seed, use of balanced dose of fertilizer, method and time of sowing, timely weed management and need based plant protection. The average yield of pea increased 31.53 per cent. The yield of pea could be increased over the yield obtained under farmers practices (use of non-descriptive local variety, no use of the balanced dose of fertilizer, untimely sowing and no control measure adopted for pest management) of pea cultivation. Similar trends were also observed in case of yield attributing character. The above findings are in similarity with the findings of Singh (2002) [6].

Technology Gap

The technology gap, the differences between potential yield and yield of demonstration plots were 10 and 20 q/ha during 2011-12 and 2016-17 respectively. On an average technology gap under four year OFTs programme was15 q/ha. The technology gap observed may be attributed to dissimilarity in the soil fertility status, agricultural practices and local climatic situation.

Extension Gap

Extension gap of 15 and 20 q/ha was observed during 2011-12 and 2016-17 respectively. On an average extension gap was observed 22.5 q/ha which emphasized the need to educate the farmers through various extension means i.e. On Farm Testing for adoption of improved production and protection technologies, to revert the trend of wide extension gap. More and more use of latest production technologies with high yielding varieties will subsequently change this alarming trend of galloping extension gap.

Technology Index

The technology index shows the feasibility of the demonstrated technology at the farmers field. The technology index varied from 11.11 to 22.22 per cent (table-3). On an average technology index was observed16.66 per cent, which shows the efficacy of good performance of technical interventions. This will accelerate the adoption of demonstrated technical intervention to increase the yield performance of pea.

Economic Return

The inputs and outputs prices of commodities prevailed during the study of demonstration were taken for calculating net return and benefit: cost ratio (Table 4). The cultivation of pea under improved technologies gave higher net return Rs. 92000, 72000 per ha in 2011-12 and 2016-17 respectively as compare to farmers practice. Similar findings were reported by Kirar *et al.* (2006) [2]. The benefit: cost ratio of pea cultivation under improved cultivation practices were 2.35 and 2.06 as compare to 2.16 and 1.677 under farmer's practice. This may be due to higher yield obtained under improved technologies compared to farmer's practice. This finding is in corroboration with the findings of Mokidue *et al*. (2011) [3].

Table 1: Differences between technological intervention and farmers practices under OFTs in pea.

S. No.	Particulars	Technological intervention	Existing practices	Gap
1	Farming situation	Irrigated	Irrigated	Nil
2	Variety	PSM-3	Azad	Partial Gap
3	Time of sowing	20-25 Oct.	1st of Nov.	Partial Gap
4	Method of sowing	Line Sowing	Broadcast	Full gap
5	Seed treatment	Carbendazim	No seed treatment	Full gap
6	Seed rate	80 kg/ha	100 kg/ha	Partial Gap
7	Fertilizer dose	N:P:K=20:60:30	Imbalance	Full gap
8	Plant Protection	Trichoderma 5g/kg seed	No plant protection	Full gap
9	Weed management	Pendimetahlin 1 kg ai/ha	No weed management	Full gap

Table 2: Yield and yield attributing character of pea variety PSM-3 under OFTs.

Year	Variety	Trial No.	Area (ha)	Average yield (q/ha)		Percent increase	No. of pods/plant	
				Trial	Farmers practice		Trial	Farmers practice
2011-12	PSM-3	10	2.0	80	65	23.07	28	19
2016-17	PSM-3	10	2.0	70	50	40.00	20	14
Total/Average		20	4.0	75	57.5	31.53	24	16.5

Table 3: Technology & Extension gap and Technological Index of pea variety PSM-3 under OFTs.

Year	Variety	Trial No.	Area (ha)	Technology gap (q/ha)	Extension gap (q/ha)	Technological index (%)
2011-12	PSM-3	10	2.0	10.00	15.0	11.11
2016-17	PSM-3	10	2.0	20.00	20.0	22.22
Total/Average		20	4.0	15.0	22.5	16.66

Table 4: Economic Impact of pea variety PSM-3 under OFTs.

Year	Variety	Trial No.	Area (ha)	Gross Income (Rs./ha)		Net Return (Rs./ha)		B:C Ratio	
				Trial	Farmers practice	Trial	Farmer's Practice	Trial	Farmer's Practice
2011-12	PSM-3	10	2.0	160,000	130,000	92000	80000	2.35	2.16
2016-17	PSM-3	10	2.0	140,000	100,000	72000	40000	2.06	1.67

Conclusion

The OFTs produces a significant positive result and provided the researcher an opportunity to demonstrate the productivity potential and profitability of the latest technology (Intervention) under real farming situation, which they have been advocating for long time. This could be circumventing some of the constraints in the existing transfer of technology system in the district, Sidhi and Hoshangabad of Madhya Pradesh. The productivity under OFTs over existing practices of pea cultivation created greater awareness and motivated the other farmers to adopt suitable production technology of pea in the district. The constraints faced by the farmers were different for different technologies. Efforts should, therefore, be made by the extension agencies in their transfer of technology programmes to consider the constraints as perceived by the farmers in this investigations as well as personal. Therefore, for enhancing the production & productivity of pea, strategy should be made for getting the more and more recommended technologies adopted by the farmers, hence this technology recommended for front line demonstration in future.

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