

Assessment of Yield Gap in Chickpea through Integrated Plant Production and Protection Technology in Rainfed Rice Fallow Land Areas

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Received 26 July 2016; Accepted 31 August 2016; Published online 15 September 2016

Abstract The plant production and protection technology (IPPPT) program was effective in changing attitude, skill and knowledge of recent technology for high yielding varieties, balanced dose of the fertilizer and biological disease management of chickpea including their adoption. This also improved the relationship between farmers and scientist and built confidence between them. The demonstration farmers acted as a source of information and pure seeds of wider dissemination of high yielding varieties of chickpea for the other farmers. The productivity gain under IPPPT over conventional

practices of chickpea created greater awareness and motivated the other farmers to adopt appropriate recent production and protection technologies in the district. The critical input supplied and farmer's participatory approach in planning and conducting the demonstration definitely helped in the transfer of technology to the farmers, thus, it is concluded that fulfill yield gap and extension agencies can also play a significant role to transfer of improved technologies to farming community for better production.

Keywords Chickpea, RRFL, Yield, Rainfed.

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Introduction

In pulses production, India is the largest producer in the world and sharing 25% in the global production. The area, production and productivity of the pulses in the country are 23.63 million hectare, 14.56 million tones and 6.25 q/ha respectively [1]. Chickpea (*Cicer arietinum* Linn.) is an important winter -season food legume having extensive geographical distribution and contributing 39% to the total production of pulse in the country. It is a good sources of protein (18—22%), carbohydrate (52—70%), fat

(4- 10%), minerals(calcium phosphorus, iron) and vitamins. It is an excellent animal feed. Its straw also had good forage value. Chickpea is the premier pulse crop in India occupying 7.10 million hectares area and contributing 5.75 million tones yield to the national pulse basket. It is grown throughout the country excepting on high altitude of northern and north eastern regions and coastal peninsula. The major chickpea producing states are Andhra Pradesh, Madhya Pradesh, Rajasthan, Uttar Pradesh, Maharashtra, Haryana, Karnataka, Gujarat, Bihar and west Bengal. The area, production and productivity of chickpea in the states of Madhya Pradesh are 2888.4 thousand hectares, 2,265.6 thousand tons and 7.85 q/ha in the year 2010 - 11 respectively. In Madhya Pradesh highest productivity of chickpea has been reported in Gwalior district (1,779 kg/ha). The area, production and productivity of chickpea in the district Rewa of Madhya Pradesh are 51.5 thousand hectares, 40.7 thousand tons and 7.90 q/ha respectively.

Gram pod borer (*Helicoverpa armigera* Hubner), Gram semilooper (*Autographa nigrisigna*), Termite (*Odontotermes obesus* Ramb. and *Microtermes obesi* Heomgr), Cut worm (*Agrotis ipsilon* Rott), Aphid (*Aphis craccivora* Koch), Wilt (*Fusarium oxysporum* f. sp. Cicerit), Collar rot (*Sclerotium rolfsii* Sacc.), Black rot (*Rhizoctonia solani*), Stem rot (*Sclerotinia* (lib.) Mass.), Ascochyta blight (*Ascochyta rabiei* Pases Labr) and Botrytis grey mould (*Botrytis cinerea* Pers. Ex. Fr.) are major biotic stresses in the region. Among these biotic stresses, the gram pod borer (*Helicoverpa armigera* Hubner) is a major pest accounting for 75% pod damage in the crop [2]. In spite of these biotic stresses, several other abiotic factors are responsible for declining the yield potential. Though much progress have been made in the field of agriculture research and education, but full benefits of these developments could not be realized by the farming community because of low adoption of technologies at the user's level. IPPPT demonstration is an introduction by the ICRISAT, Hyderabad with inception of national food security mission of pulse crops during XI plan. The field demonstrations are conducted under the close supervision of scientist. The basic objectives of IPPPT demonstration are to

spread the newly introduced high yielding varieties of chickpea speedily and acquaint extension functionaries and local farmers with front line varieties and management technologies. IPPPT demonstrations were undertaken by the Directorate Farms, JNKVV, Jabalpur (MP) on the improved package of practices of chickpea in the Rewa district.

(The authors are grateful to ICRISAT, Patancheru, Hyderabad in collaboration with JNKVV for their financial assistance and special guidance under the research project entitled enhancing of chickpea production in rainfed rice fallow land adopting improved pulse production and production technology (IPPPT).

Materials and Methods

Improved pulse production and production technology demonstration (IPPPT) chick pea was conducted by Directorate Farms, JNKVV, Jabalpur, Madhya Pradesh during the period from 2008-2011 in fifteen villages viz. Bilwa Khokham, Jhiriya, Ghuraihata, Bahuribandh, Puraini, Saanw, Tikiya, Veerkham, Kapsa, Amrah, Sir-1, Gophi, Doobaha, Jagir in Rewa block of Rewa district.

All total 550 numbers of demonstrations were conducted. The component demonstration of rainfed rice fallow land (RRFL) technology in Chickpea i.e. improved variety JG 130 balanced dose of fertilizer (18 kg Nitrogen + 46 kg P₂O₅ /ha) and use of

Table 1. Technical intervention over farmers practice.

Sl. No.	Component	Technological intervention	Farmers practices
1	Variety	JG130	Local
2	Seed treatment	Trichoderma powder @ 5 g/kg of seed	No seed treatment
3	Fertilizer dose	18 kg N and 46 kg P ₂ O ₅ per hectare	No use of fertilizer
4	Plant protection measure	Wilt resistant varieties, No use or bird punchers and monocrotophos @ 1.5 lit/ha at appropriate time	indiscriminate use

Table 2. Common production and protection technologies applied.

Sl. No.	No of components	Production and protection technologies
1	Seed rate and sowing methods	75-100 kg/ha on the basis of seed size, line sowing (R × R 30 cm) (P × P 10 cm) and 6 cm deep
2	Situation and soil type	Rainfed (RRFL), sandy loam
3	Weed management	Two mechanical weeding, one at 30 days after sowing and another at 60 days after sowing
4	Plant protection and disease management	Wilt resistant varieties, bird punchers and need based pesticides spray for pod borer

Trichoderma @ 5 g/kg of seed as seed treatment were taken. Demonstrations were conducted covering 200 ha in three consecutive years. One control plot was also kept by the side of the demonstration where farmers's practices was carried out. All the production and protection technologies other than interventions were applied in similar manner in demonstrated as well as in farmer's practices. The yield gap was calculated between demonstrated and local check and the results are presented here.

Results and Discussion

The details of the intervention on technology demonstrated along with farmers practice have been presented in Table 1. Latest variety JG130 was demonstrated over the farmers' traditional varieties. Similarly, seed treatment with Trichoderma powder @ 5g /kg of seed and recommended fertilizer i.e. 18 kg N and 46 kg P₂O₅ were demonstrated where the farmers are not applying any fertilizer and practiced seed treatment. Further, monocrotophos 1.5 lit/ha at appropriate time were demonstrated against the farmers practice of no use or indiscriminate use of pesticides.

Common production and protection technologies as demonstrated both in the demonstration and control plot have been presented in Table 2. The

Table 3. Gap in grain yield under IPPPT demonstration during 2008-2011.

Years	Under IPPPT demonstration		Average yield (qt/ha)		% increase in the yield over the farmers practices	
	No of farmers	area (ha)	Total Demo plot	Farmers practice (qt/ha)	Yield gap	
2008-09	100	20.0	13.7	9.5	4.2	44.21
2009-10	200	80	13.8	8.2	5.6	68.29
2010-11	250	100.0	12.4	8.0	4.4	55

technologies were seed rate of 75-100/ha. Line sowing at a spacing of 30 × 10 square cm with 6 cm depth, two manual weeding i.e. 30 and 60 days after sowing and need baseds praying against pod borer as well as disease management.

Common production and protection technologies were applied to assess the impact of variety, seed treatment and spraying of monocrotophos. The results obtained during three years are presented in table 3. It is revealed that an average yield of 13.30q/ha were obtained in the demonstration plots against the yield of 8.57 q/ha if the farmers practice. The highest yield in the demonstration plot as well as control plot 13.8 q/ha during 2009-10 and 9.5 q/ha respectively and lowest yield were recorded in 2008-09.

The result clearly indicated that the higher average grain yield in demonstration plots over the years compare to local check due to knowledge and adoption of full package of practices i.e. appropriate variety JG130 timely sowing, seed treatment with Trichoderma @ 5 g/kg of seed, use of balanced dose of fertilizer (18 kg N and 46 kg P₂O₅ ha), method and time of sowing, timely weed management and need based plant protection. The average yield of chickpea increased 55.83% more over local check while the year wise variation in yield to the tune of 44.21 to 68.29%. The yield of chickpea 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 chickpea cultivation. Thus, the yield gap of 4.73 q/ha.

The IPPPT demonstrations produces a significant positive result and provide 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 Rewa of Madhya Pradesh. Similar findings were reported by Kirar et al. [3].

References

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