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Evaluation of different Rabi Onion Varieties under Bihar Conditions

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ABSTRACT

Problems of onion crop production and their solutions at farming situations were studies with participation of farmers. In this regard, demonstrations on integrated crop management in onion varieties were conducted in 2017-18 during Rabi season by National Horticultural Research and Development Foundation – Patna under National Horticulture Mission, in different locations of Bihar through (TDTD) Technology Dissemination through Demonstration at selected farmers' fields. These demonstrations focused on increase productivity/ net returns of onion per unit area and get the feedback from farmers on the performance of onion varieties. The vigour of the variety is one of the major constraints in production of onion. The productivity and economic returns of onion in improved technologies were calculated and compared with the corresponding farmer's practices. All the five varieties recorded higher gross return, net return and cost benefit ratio in improved technologies as compared to the control plots as well as suksagar variety. It was found that farmers were using old varieties of onion crop without proper use of recommended scientific package of practices. Results obtained showed that over the year NHRDF Red-3 variety performed superior over local check. The gross returns Rs 2,95,502.50/ha, net returns Rs 2,10,227.50 /ha, extension gap (146.90 Q/ha) and C:B ratio 3.47were also recorded highest in NHRDF Red-3 variety compared to local variety. Technology gap was highest in NHRDF Red-4(92.84 Q/ha), whereas technology index were minimum in improved variety NHRDF Red-2 12.87% which is at par 13.09% in NHRDF Red-3 compared to local check. NHRDF Red—3 with taking 10-12 days more time for maturity, whereas Obtained minimum onion bulb yield with lower returns and B: C ratio in NHRDF Red with it was at par Agrifound Light Red. It was also recorded that Suksagar as a local variety medium adoption index due to taking 25-30 days less time for maturity in comparisons to NHRDF Red -3 and other varieties. This will subsequently increase the income as well as the livelihood of the farming community.

Keywords: Demonstration, Technology gap; Extension gap, Technology index, improved Onion varieties, TDTD.

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INTRODUCTION

India is second largest onion growing country in the world, for its pungency and availability around the year Indian onions are famous in world. India is credited with having some of the significant varieties. It is fostering to note that certain varieties of yellow onion are suitable for export to European countries. India's share in world's onion export was 9.44 percent during 2015-16. Requirement of onion is fulfilled during lean period like June to September from stored onion, as well as fresh Kharif and late Kharif onion produce in the country. It has been observed that the prices of onion increase during this period in the most part of the country. Traders stored onion produce only during the month of April-May month of Rabi onion to meet out the requirement during lean period. Because of its high export potential and domestic consumption in India, it comes under cash crop apart from vegetable Pandey, (1989). It is predominantly a Rabi season crop and most onion cultivars are sensitive to photo period and thus their range of adoption is limited (Gupta and Singh 2010). The main growing states of onion in India is Maharashtra (31.19%), Madhya Pradesh (13.61%), Karnataka (12.88%), Rajasthan (6.86%), Gujarat (6.48%), Bihar (5.96%), Andhra Pradesh (4.23%), Haryana (3.37%) and others (15.52%) Source of data is Horticulture Division, Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi. Lack of recommended and released varieties of high yielding as well as good keeping quality in the country, it creates price fluctuation during off season.

But insufficient and improper extension activities result in non-adoption of improved packages developed at research Institutes. Further the replacement ratio of traditional varieties with improved varieties and non availability of sufficient quantity of quality seeds of improved variety in a time and knowledge on improved and high yielding varieties are the major constrains in onion cultivation. Hence, there is a need to maximize the onion cultivation area with the introduction of improved cultivation technologies with high yielding varieties for onion crop. In the survey made to compile production level of onion crop at grass root level, it comes to know that, among all the production factors variety contribute a major share in the crop production. The

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Table 1: Characters of cultivars in all varieties

Variety/Parameters	Bulbs colour	Shape of Bulbs	Maturity after transplanting (days)	Bulb diameter (cm)	Weight Of bulb (g)	Plant height(cm) At Maturity stage	Yield/ sq.meter (Kg)
Agri found Light Red	Light red	Globular round	116	5.04	71.08	72.4	2.46
NHRDF Red	Attractive Dark Red	Globular round	118	5.04	68.48	74.7	2.38
NHRDF Red-2	Yellowish red	Globular	112	5.00	64.75	79.8	3.05
NHRDF Red-3	Light bronze	Globular round	125	5.25	82.03	75.4	3.48
Suksagar	Dark red	Globular	98	5.01	60.4	66.7	2.06
NHRDF Red-4	Dark red	Globular round	118	5.08	72.5	73.5	3.08
Local	Mix & dark red	Mix shape & Size	116	4.82	54.24	74.1	2.01

productivity of onion is much low in India than the world average (Lawande, 2005).

Present study total 5 high yielding varieties along with local variety as well as Suksagar variety as a control plot were evaluated to assess their performance for high productivity in Bihar. Therefore, crop demonstrations on integrated crop management in onion varieties Agrifound Light Red, NHRDF Red as improved variety with NHRDF Red-2, NHRDF Red-3 and NHRDF Red-4 as a new high yielding varieties and other local varieties with suksagar variety were conducted in farmers field during Rabi season in 2017-18 by National Horticultural Research and Development Foundation – Patna under NHM, in different locations of Bihar state through Technology Dissemination through Demonstration at selected farmers' fields were conducted. Hossain, 1997 was also being conducted which are related to costs and returns of different vegetables.

MATERIALS AND METHODS

The present study was carried out during Rabi season on the 60 farmer's fields of different district of Bihar. A large scale of 60 no's demonstration of rabi onion varieties Agri found Light Red, NHRDF Red, NHRDF Red-2, NHRDF Red-3, Suksagar and NHRDF Red-4 were arranged by NHRDF-Patna through TDTD during 2017-18 (Table 1).

Each demonstration was comprised of 0.25 ha was grown. In case of local control plots; existing practices being used by farmers were followed. In general soils of the area under study were sandy loam, clay to loamy sand and medium to low in fertility status. The TDTD was conducted to study the gaps between the potential yield and demonstration yield, extension gap and technology index. In the present evaluation study, the data on output of rabi onion cultivation were collected from TDTD plots, besides the data on local practices commonly adopted by the farmers of this region were also collected with farmers interview and was calculated .The data on production cost, input used, monitory return, gap and adoption index were collected and analyzed for the economic feasibility of the recommended technology were calculated by using following formula as suggested.

Technology gap = Potential yield – Demonstration yield

Extension gap = Demonstration yield – yield under existing practice

$$\% \text{ increase in yield} = \frac{\text{DEMONSTRATION YIELD} - \text{FARMERS YIELD}}{\text{FARMERS YIELD}} \times 100$$

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

$$\text{Adoption Index} = (Ai/Pi) \times 100$$

Adoption was operationally defined as the degree of actual use of recommended cultivation practices by onion growers. In demonstration plots, a few critical inputs in the farm of quality seed, *Trichoderma viride, Beauveria bassiana*, bio fertilizers, Agro-chemical, etc. were provided and nonmonetary inputs like timely sowing in raised bed low tunnel, poly house, transplanting on beds were also

Table 2: Potential yield, technology gap, extension gap and technology index of onion crop in different varieties under TDTD in Bihar state during 2017-18:

Variety/Parameters	**Agrifound Light Red**	**NHRDF Red**	**NHRDF Red-2**	**NHRDF Red-3**	**Suksagar**	**NHRDF Red-4**	**Local**
Area (ha)	3	3	3	3	3	3	12
No. of farmers	12	12	12	12	12	12	48
Potential Yield (Q. / ha)	300	300	350	400	250	400	250
Yield (Q/ha)	245.74	238.15	304.95	347.65	206.24	307.16	200.75
% increase over control	22.41	18.63	51.91	73.16	2.73	53.01	-
Technology gap (Q/ha)	56.26	61.85	45.05	52.35	43.76	92.84	-
Extension gap (Q/ha)	44.99	37.40	104.20	146.90	5.49	106.41	-
Technology index (%)	18.09	20..62	12.87	13.09	17.50	23.21	19.70
Adoption score by respondent (AI)	5	4	3	6	5	3	2
Possible score (PI)	7	7	7	7	7	7	7
Adoption index	71.42	57.14	42.89	85.71	71.42	42.89	28.57

performed in all plots. Traditional practices were maintained in case of local control.

The farmers involved in demonstration were facilitated by NHRDF experts/ scientist in performing field operations like nursery sowing, transplanting, irrigation, spraying, weeding, harvesting etc. during the course of training and visit.

RESULTS AND DISCUSSION

From the data presented in **Table 2**, it is revealed that demonstration yield of all NHRDF Red-3, NHRDF Red -4, NHRDF Red-2, Agrifound Light Red and NHRDF Red performed better than their respective local check. The NHRDF Red -3 variety recorded highest yield of 347.65 Q/ha with 73.16% average increased yield over the control plot followed by NHRDF Red -4 (307.16 Q/ha) with 53.01%, NHRDF Red-2 (304.95 Q/ha) with 51.91%, Agrifound Light Red (245.74 Q/ha) with 22.41% and NHRDF Red (238.15 Q/ha) with 18.63% average increase yield over control plot respectively.

The highest technology gap of 92.84 q/ha was recorded in NHRDF Red-4 variety i.e. yield gap between demonstrated technology and potential yield that needs to be minimized with the conduction of demonstrations. The variation in technology gap during the demonstration year may be due to varied soil fertility, climatic condition of the area and management practices implemented by the farmers, knowledge of farmers regarding improved varieties/ practices and productivity of variety. Hence more location specific recommendations and precise use of technology in the field are necessary to bridge the technology gap as supported by Singh et al. 2018, whereas minimum in by NHRDF Red-2 is45.05 q/ha in demonstration plot. The results are in conformity with the findings of Ojha (2013).

Further higher extension gap of 146.90 q/ha was recorded in variety NHRDF Red-3 between demonstration technology and control plot was observed, where as minimum in NHRDF Red 37.40q/ha was recorded and Suksagar 5.49 q/ha was recorded. The progressive use of improved crop production technologies with high yielding variety will subsequently change this alarming trend of galloping extension gap. Which emphasized the need to educate the farmers through various extension means for adoption of improved varieties to reserve wider extension gap.

The technology index shows the feasibility of the variety at farmer's field. The lower the value of technology index more is the feasibility. Table 2 revealed that the technology index was minimum in NHRDF Red-2 was 12.87% which is at par 13.09% in NHRDF Red-3 followed by Suksagar 17.50%, Agrifound Light Red 18.09% and NHRDF Red 20.62% and maximum in NHRDF Red-4 (23.21%) variety suggesting the superiority and better performance of all varieties compared to local.

Technology adoption index was maximum in NHRDF Red -3 (85.71 %) followed by Agrifound Light red (71.42%) and Suksagar (71.42%) , NHRDF Red (57.14%), NHRDF Red-2 (42.89%) and it was at par with NHRDF Red-4 (42.89%) , whereas minimum adoption index was observed in control (28.57%) that is due to awareness of farmer's as well as soil, climatic conditions and adoption of improved cultivation practices and timely sowing of seed , mainly on due to variety productivity, bulb colour and self life of bulbs etc. This may be attributed to dissimilarity in the soil, fertility status, weather condition and un- aware of educate the farmers more about the improved cultivation practices and improved varieties and it means more feasibility of technology disseminations in state.

The variety wise economics of onion production under demonstrations were estimated and the results have been presented in **Table 3**. The economics analysis of the data over the year revealed that NHRDF Red-3 variety recorded higher gross returns Rs 2, 95,502.50, net returns Rs 2, 10,227.50 and C: B ratio 3.47 compared to local variety. That is the additional net returns Rs 1, 35,445.00 on the additional expense of Rs 9495.00 only as an adoption cost over control (Rs/ha) followed by net returns of Rs 1, 75,811.00 and B: C ratio 3.06 was obtained in the demonstrated technology of NHRDF Red-4 variety over control plot with net monetary returns Rs 74,782.50 and B: C 1.99 in local variety. The higher returns were due to higher bulbs yields as well as higher market price with sorting/grading of bulbs obtained in the demonstration technology over control plots. It is also revealed that returns were directly influenced by the market price of onion bulbs and cost of production during the year of the demonstrations. During all the varieties of demonstrations, the increased gross returns, net returns and Cost benefit ratio were obtained in the demonstrated technology over control plots.

These findings are in confirmation with the findings of Rajput *et al.* (2016), Rajput *et al.* (2018) and Teggelli *et al.* (2015). Whereas lowest net returns obtained 1, 16,317.00 and B: C ratio 2.45 was obtained in Agrifound Light Red variety of demonstrated technology. Whereas minimum additional net returns Rs 41,534.50 on the additional expense of Rs 4495.00 only as an adoption cost over control (Rs/ha). Means adoption

Table 3: Comparison of returns onion cultivation for all 6 varieties during 2017-18

Variety/Parameters	Agri found Light Red	NHRDF Red	NHRDF Red-2	NHRDF Red-3	Suksagar	NHRDF Red-4	Local
Cost of production (Rs/ha	80275.00	86150.00	80275.00	85275.00	85275.00	85275.00	75780.00
Adoption cost of production over control(Rs/ha)	4495.00	10370.00	4495.00	9495.00	9495.00	9495.00	-
Sale @ Rs/Q (Rs)	800.00	900.00	800.00	850.00	850.00	850.00	750.00
Gross return(Rs/ha)	196592.00	128185.00	*163685.00*	*295502.50*	175304.00	261086.00	150562.50
Net return(Rs/ha)	116317.00	128185.00	*163685.00*	*210227.50*	*90029.00*	*175811.00*	*74782.50*
Additional net returns over control (RS/ha)	41534.50	53402.25	88902.50	135445.00	15246.50	101028.50	-
C: B ratio	2.45	2..49	3 .04	3..47	2.06	3..06	1.99

of improved /high yielding varieties/ improved technology are clearly shown more beneficial.

CONCLUSION

Performance of all NHRDF varieties viz ., NHRDF Red-3, NHRDF Red -4, NHRDF Red-2, Agrifound Light Red and NHRDF Red under demonstration were found better than their respective local check. The NHRDF Red -3 variety recorded highest yield of 347.65 Q/ha with 73.16% average increased yield over the control plot followed by NHRDF Red -4 (307.16 Q/ha) with 53.01%, The economics analysis of the data over the year revealed that NHRDF Red-3 variety recorded higher gross returns Rs. 2, 95,502.50, net returns Rs 2, 10,227.50 and C: B ratio 3.47 compared to local variety. That is the additional net returns Rs 1, 35,445.00 on the additional expense of Rs 9495.00 only as an adoption cost over control (Rs/ha) followed by net returns of Rs 1, 75,811.00 and B: C ratio 3.06 was obtained in the demonstrated technology of NHRDF Red-4 variety over control plot with net monetary returns Rs 74,782.50 and B: C 1.99 in local variety.

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