

Assessment of different weedicides for Controlling weeds in Rabi onion

Abstract:

An attempt was made to find out the appropriate weed management practices for weed control in onion which is practically effective and economically feasible for farmers. Onions are slow-growing, shallow-rooted crops that can suffer severe yield loss from weed competition. Their narrow, upright leaves and non-branching habit do not compete well with weeds. In addition, their long growing season, frequent irrigation water and fertilizer application allows for successive flushes of weeds. The experiment was conducted at the farmers' field of Saharsa district, Bihar as 'On Farm Trial' mode for two years during 2017 and 2018 in Rabi season. The best treatment in terms of net return was Technology option-III, which gave the highest net return up to Rs 275420 q/ha. Benefit cost ratio varied significantly among the treatments. The highest benefit cost ratio (2.92) was found in Technology option-III which was statistically similar to Technology option-II (2.66).

Keywords: weed management, irrigation, fertilizer, Rabi season

INTRODUCTION

Onion (*Allium cepa* L.) is popularly known as "Queen of kitchen" because of its characteristic flavour. India is the second largest producer of onion in the world, next to China. In India, it is being grown on an area of 1.28 m ha with a production of average 23.26 mt and the productivity is 18.1 tonnes per hectare which is quite low (Anonymous, 2018). It is mainly used for cuisine and culinary purpose and also preventing coronary heart diseases and other ailments (Sangha *et al.*, 2003). Onions are slow-growing, shallow-rooted crops that can suffer severe yield loss from weed competition. Their narrow, upright leaves and non-branching habit do not compete well with weeds. In addition, their long growing season, frequent irrigation water and fertilizer application allows for successive flushes of weeds. Due to this type of growing habit, onion crop cannot compete well with weeds; yield loss due to weed infestation in onion has been recorded to the tune of 40 to 80% (Channapagouda *et al.*, 2007 and Urraiya and Jha, 2017). Singh *et al.* (2016) also reported un-controlled weed growth reduces the bulb yield up to 40-80% depending upon the nature of intensity and duration of weed competition in onion field. In the last few decades different herbicides were used alone or in combination to eliminate the weeds but their efficiency differs because of

their narrow spectrum of weed control (Mainet *et al.*, 2007). Severe labour crisis makes weed control very difficult at the critical period and causing huge yield gap. The conventional methods of weed control (hoeing and weeding) are laborious, expensive and insufficient. Hence, an attempt was made to find out the appropriate weed management practices for weed control in onion which is practically effective and economically feasible for farmers.

MATERIALS AND METHODS

The experiment was conducted at the farmers' field of Saharsa district, Bihar as 'On Farm Trial' mode for two years during 2017 and 2018 in *Rabi* season. The planting was done during last week of October and the variety *Nasik-53* was used for this experiment. A Randomized Block Design (RBD) was used with three replications. The soil being clayey loam in texture, it was ploughed by tractor and then harrowed. The plot size was 3m x 3m and the plants being planted at a distance of 15cm x 10cm. NPK were applied at recommended rates just before transplanting and half of the nitrogen was applied after four weeks of transplanting. The crop was harvested during last week of April. The detail of technologies assessment/refinement, farming situation, area of intervention and technology option was presented in Table-1.

Table-1 Technology option assessed during Rabi 2017 and 2018

Problem area	Important cause	Production system	Micro farming situation
Low productivity of Onion	High infestation of Weeds	Rice- Onion	Irrigated medium land with clay to sandy clay loam soil
Intervention plan			
Farmers' practice-I	Hand Weeding (HW) at 30 DAS		
Technology option-II	Pendimethalin @ 3ml/l as pre-emergence followed by Oxyfluorfen @ 1ml/l within 30-32 days		
Technology option-III	Pendimethalin @ 3ml/l as pre-emergence followed by Imazathapyr @ 1.2ml/l as post-emergence at 45 DAT		

RESULTS AND DISCUSSION

Growth and Yield Parameters

All two weed management treatments were superior over farmers plot in respect of all growth and yield attributes and also the bulb yield (Table 2). The highest growth attributes (plant height, neck thickness) and yield attributes (polar and equatorial diameter and weight of

bulb) and bulb yield were observed in Technology option-III. However, Technology option-II was at second place in respect of all these attributes. Whereas, the lowest all growth and yield attributes and bulb yield were reported under farmer's plot (without hand weeding and chemical herbicides). It might be due to less weed crop competition throughout crop growth period by chemical weeding i.e., in Technology option-III, which in turn maintains the soil fertility status by way of removing less plant nutrients through weeds and ultimately has a favourable effect on growth parameters and yield attributes. These findings are in close proximity with the reports of Bhartiya *et al.* (2011); Kalhapure *et al.* (2013); Gandolkar *et al.* (2015) and Kumar *et al.* (2014) who worked with different crops. Increased crop growth and bulb weight in Technology option-III was a favorable environment received to the crop to express better plant growth. This increase in crop growth was due to less crop weed completion at the earlier stage of crop growth.

Crop Yield

Among all the treatments, the highest bulb yield (268 q/ha) was obtained in Technology option-III i.e. Pendimethalin @ 3ml/l as pre-emergence followed by Imazathapyr @ 1.2ml/l as post-emergence at 45 DAT followed by Technology option-III i.e. Pendimethalin @ 3ml/l as pre-emergence followed by Oxyfluorfen @ 1ml/l within 30-32 days. The lowest bulb yield of 182 q/ha was observed in the farmer's plots. Combinations of herbicides treated plots fetched better results due to the efficient weed control which provided an opportunity for the crop to utilize the available resources efficiently to produce good yield. The lowest yield (182 q/ha) in farmer's plot may be due to weed competition. Thus, reducing availability of moisture, light and nutrients to the crop results in loss of yield in the weeded plot. This supports the findings of Verma and Singh (1996) in onion. Weed free plot reduced the competition from the weeds to a greater extent and thus helped in faster growth and development of onion bulb crop, resulting in obtaining higher values of all yield attributing characters. The findings are in close vicinity of those reported by many researchers Warade *et al.* (2006) and Saraf (2007) with respect to onion yield.

Dry Weight of Weeds

The significant effect on total dry weight of weeds (Table 3) was found due to different herbicide treatments. The maximum dry weight (22.8g) was found in Farmer's practice-I. The lowest dry weight (12.7) however, was found in Technology option-III. The dry weight of weeds may be due to the increased weed population and continuous growth and

may also be due to the higher amount of nutrient uptake (Patelet *al.*, 2012). The variability in weed population between the different treatments could be attributed to differences in the spectrum of weeds present and differences in the spectrum of control by each herbicide. These results agreed with those of Ghaffoor, 2004 and Khokharet *al.*, 2006.

Effect on Economic Returns

However, the best treatment in terms of net return was Technology option-III, which gave the highest net return up to Rs 275420 q/ha. Benefit cost ratio varied significantly among the treatments. The highest benefit cost ratio (2.92) was found in Technology option-III which was statistically similar to Technology option-II (2.66). On the other hand, the lowest benefit cost ratio (1.18) per hectare was obtained from farmer's plot. Technology option-III produced the highest benefit cost ratio because weed free plot reduced the competition from the weeds to a greater extent and thus helped in faster growth and development of onion bulb crop, resulting in obtaining higher values of all yield attributing characters. The results regarding gain of highest monetary returns and cost benefit ratio with integrated weed management practices are supported with the results of Nandal and Singh (2002) and Pugalendhi *et al.* (2011) who have studied the economic returns parameters in INM in onion crop under various climatic conditions.

CONCLUSION

On the basis of two years data, it may be concluded that application of Pendimethalin @ 3ml/l as pre-emergence followed by Imazathapyr @ 1.2ml/l as post-emergence at 45 DAT gave significantly higher plant height, bulb yield, net return and B:C ratio as compared to other treatments tested and significantly reduced the weed count and weed dry matter in onion crop is the best option for chemical weed control in onion crop to gain desirable yields.

fig 1 : Effect of herbicide application on growth and yield characters of onion Var N-53

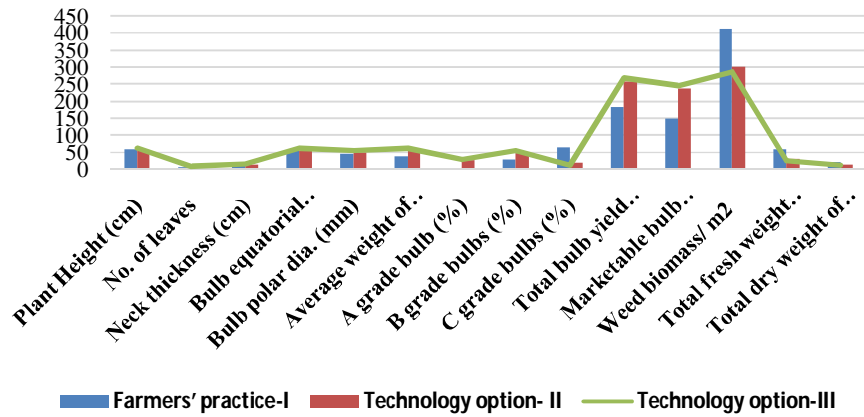


fig 2 : Effect of herbicide application on Economics of onion Var N-53

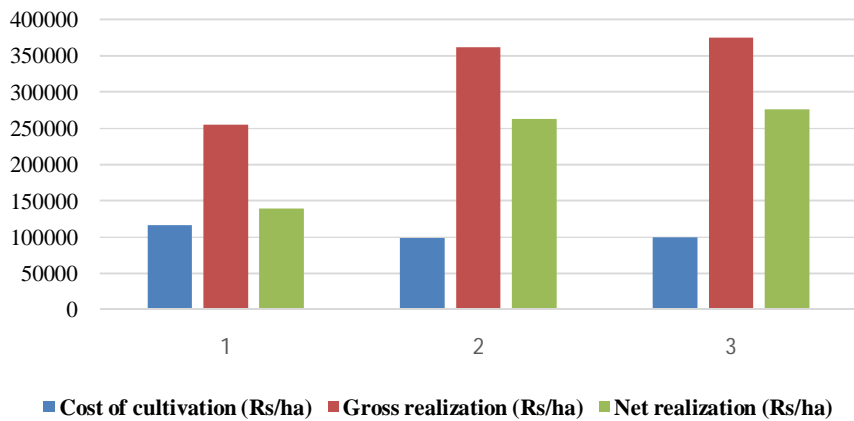


Table-2 Effect of herbicide application on growth and yield characters of onion Var N-53

Treatment	Plant Height (cm)	No. of leaves	Neck thickness (cm)	Bulb equatorial dia. (mm)	Bulb polar dia. (mm)	Average weight of bulb (g)	A grade bulb (%)	B grade bulbs (%)	C grade bulbs (%)	Total bulb yield (q/ha)	Marketable bulb yield (q/ha)
Farmers' practice-I	60.4	7.3	12.4	55.6	45.0	38.4	3.60	30.5	64.2	182	150
Technology option- II	58.8	9.1	13.6	56.7	50.9	61.2	27.4	47.9	18.7	258	238
Technology option-III	61.8	9.1	15.3	62.5	55.5	62.5	28.0	54.3	13.1	268	246
SEm ±	0.88	0.76	0.55	0.71	0.83	0.58	1.18	0.59	0.41	0.77	1.06
CD at 5%	2.08	1.80	1.30	1.67	1.97	1.36	2.80	1.38	0.98	1.83	2.50
CV (%)	1.03	6.33	2.82	0.86	1.17	0.75	2.46	0.94	0.91	0.23	0.20

Table 3 Effect of herbicide application on weed parameters and Economics of onion Var N-53

Treatment	Weed biomass/m ²	Total fresh weight of weeds (g)	Total dry weight of weeds (g)	Cost of cultivation (Rs/ha)	Gross realization (Rs/ha)	Net realization	B:C ratio
Farmers' practice-I	411.0	60.1	22.8	116390	254800	138410	1.18
Technology option-II	300.4	31.0	13.8	98808	361200	262392	2.66
Technology option-III	285.7	24.5	12.7	99780	375200	275420	2.92
SEm ±	0.69	0.63	0.35	-	-	-	-
CD at 5%	1.62	1.50	0.83	-	-	-	-
CV (%)	0.08	1.16	1.51	-	-	-	-

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UNDER PEER REVIEW