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Effect of improved variety, fungicides and weedicides on growth and yield of lentil (*Lens esculenta* Moench)

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Abstract

Pulses are one of the major constituents in Indian foods, majority as a protein source. Today, the country produces 17.52MT of pulses, which is insufficient to meet our needs. This is being addressed by importing pulses from other countries. An investigation as On Farm Trial (OFT) was conducted on farmer's field in Tal area of Patna district to evaluate efficiency of different varieties of lentil Crop, use of different fungicides and weedicides to control diseases and weed in lentil crop respectively, during the Rabi Season. IPL-407 was observed to be most suitable variety giving maximal yield (12.5 q/ha), which may be attributed to favorable growth and yield contributing characters (no. of branches/Plant, no. of pods/ plant, seed weight/pods). Again seed treatment with carbendazim, chlorpyrifos and Rhizobium culture and soil treatment with *Trichoderma viridae* followed by two alternate spray of copper hydroxide and hexaconazole was observed to increase crop yield significantly when compared to control (farmer's practice) which may be because of reduced disease incidences in the crop. Even weed control by Pendimethalin and Imazethapyr resulted in significantly higher number of pod/plant, seed weight/pod and ultimately grain yield which may be attributed to higher weed control efficiency (82%). The farmers under test were satisfied with the varietal trial and technology of fungal disease and weed control practices in reducing diseases and weed infestation and ultimately improvement in grain yield of lentil.

Keywords: Improved variety, *Lens esculenta* Moench

Introduction

India is the largest producer, as well as the biggest consumer and importer of pulses in the world, both in quality and quantity. The important pulses which are grown are lentil, gram, pigeonpea, green gram, pea and cow pea. Pulses production achieved all time high record of 19.27 million tonnes in 2013-14. Pulses promote long-term sustainability to the Indian agriculture. Bihar ranks 6th in area and 5th in production of pulses. The “Tal” area from Fatuha to Lakhisarai in Central Bihar account for nearly 50% of pulse production. The area is converted into a big water mass during the rainy season, but transforms into a very fertile land mass when the water find an escape route into river Ganga. The farmers then grow pulses like lentil and chickpea in the clay soil, ideal for such leguminous crops. Despite the potential for further yield increase, lentil production faces numerous problems including wilt infestation and weed problems leading to low yield. As the population continues to increase, new productive lentil varieties, proper wilt and weed management practices are needed that will overcome these problems and increase the yield. Keeping this in mind present study was conducted under Tal area to see the varietal trial and effect of use of different fungicides and herbicides on growth and yield of lentil Crop.

Materials and Methods

The present Investigation was conducted as On Farm Trial on farmers field Under KVK, Patna to study the

1. Evaluation of different varieties of lentil under Tal area
2. Efficiency of different fungicide for controlling diseases of lentil and
3. Weed control of sole crop of lentil.

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The varietal trial considered of four treatments (varieties of lentil) including local variety and three improved varieties, namely, Arun, IPL-406 and HUL-57.

Fungicide trial consisted of four treatments including farmers practice (No seed and soil treatment) and three technological options, viz. (1) Seed treatment with Carbendazim @ 2 gm/kg seed followed by chlorpyrifos@8 ml/kg seed and Rhizobium culture (FIR), (2) Technological option 1 + Soil treatment with Trichoderma viridae@4 kg/ha and (3) Technological option II + two alternate spray of copper hydroxide @1.25 kg/ha and Hexaconazole@ 1lit/ha.

Weedicide trial consisted of four treatments as(1) Pendimethalin 30% EC @1 Kg a.i./ha up to 3 days of sowing, (2) Pendimethalin capsulated suspension @ 0.75 Kg a.i./ha up to 3 days after sowing (3) Pendimethalin 30% EC @0.5 Kg a.i./ha+ Imazethapyr @20 gm a.i. up to 3 days after sowing (4) Weedy Check.

The experiments were laid out in randomized block complete design considering individual farmers plot as replication in individual plot size of 0.1 ha.

Results and Discussions

It was observed that number of branches per plant and weight of 1000 grains/g were significantly higher in all the three improved varieties as compared to the local variety (Table 1). Grain yield was maximum in IPL-406 variety (12.5 q/ha) followed by HUL-57, Arun and local variety, which may be attributed to higher no. of branches per plant, higher number of pods per plant and better grain weight in IPL-406, comparatively. Net return of IPL-406 is almost four times than net return of the local variety, which might be attributed to lower yield of local variety i.e. 6.67 q/ha. Kamara *et al.* [2008] reported that despite the yield benefits of new varieties, farmers have shown preference for local ones, even when introduced varieties give higher grain yields. The reasons, among others, are that farmers are using stored at home lentil grains as seed without proper seed treatment and

at high seed rate (increasing cost of cultivation).

Lentil cultivation in Tal area has been observed to be badly affected by severe wilt infestation. It was observed that plant population was highest having lowest incidence of diseases when seed were treated with carbendazim @ 2 gm/kg followed by chlorpyrifos @8 ml/kg and Rhizobium culture (FIR), soil treatment was properly done with Trichoderma viridae@4 kg/ha and two alternate spray of copper hydroxide (1.25 kg/ha) and Hexaconazole @1 lit/ha (Table 2). Yield was also significantly lower in case of control than all the three fungicide trials which may be attributed to lack of seed and soil treatment in control. So, proper seed and soil treatment with two spray of Copper hydroxide and Hexaconazole must be followed by farmers for control of wilt disease and increase in the yield of lentil crop.

The effect of herbicides (Pendimethalin Capsulated Suspension and Pendimethalin 30% +Imazethapyr) on grain and straw yield of lentil was found significantly superior than control (Table-4). This could be attributed to favorable growth and yield attributing characters like number of pod per plant, and test weight of seeds as well as efficiency of herbicide in controlling weeds to the extent of 82% (Table 3). Chaudhary *et al.*, (2011) [2] found that the pre emergence application of pendimethalin gave good control of broad leaved weeds (87.79%) and average control of narrow leaved weeds (77.06%), respectively. Similar results in controlling weeds of lentil by pendimethalin and quizalofop ethyl were also found by Lungdim *et al.*, (2013) [4], Yadav *et al.*, (2013) [7] and Chandrakar *et al.*, (2016) [1]. No. of pods/plant is known to have significant positive correlation with grain yield in lentil (Singh and *et al.*, 2009) [6]. Economic studies revealed that use of Pre emergence herbicides (Pendimethalin and Imazethapyr) recorded highest net return (Rs. 48, 524) and benefit cost ratio (2.80) respectively, whereas lowest gross return and net return with benefit cost ratio (2.18) were recorded in Control. Similar findings were also reported by Singh *et al.*, (2018) [5].

Table 1: Performance of different varieties of lentil on performance indicators

Technological Options	No. of Branch/Plant	No. of Pod/Plant	1000 Grain weight(g)	Grain Yield (q/ha)	Gross cost	Gross return	Net return	B:C ratio
Local variety of Lentil	6.83	118.50	23.00	6.67	29,900	36,685	7,785	1.27
Arun	8.2	222.3	27.3	9.0	32,500	49,500	17,000	1.52
IPL-406	13.7	239.3	32.3	12.5	32,500	68,750	36,250	2.12
HUL-57	9.7	234.7	25.2	9.4	32,500	51,700	19,200	1.59
SEM	0.41	8.25	0.43	0.38				
CD	0.87	17.58	0.92	0.81				
CV%	12.86	12.15	4.80	12.09				

Table 2: Performance of fungicides on performance indicators

	Plant population/m ²	Disease incidence	Yield (q/ha)	Gross cost (Rs.)	Gross return (Rs.)	Net return (Rs.)	B:C ratio
No seed and soil treatment	250.0	23.9	6.9	21,600.00	37,950.00	16,350.00	1.75
Seed treatment with Carbendazim @ 2 gm/kg followed by Chlorpyrifos @ 8 ml/kg and Rhizobium culture (FIR)	278.2	20.9	9.6	28,880.00	52,800.00	23,920.00	1.82
Technological Option I + Soil treatment with Trichoderma viridae @ 4 kg/ha	312.5	14.3	11.3	33,600.00	62,150.00	28,550.00	1.84
Technological Option II + Two alternate spray of Copper hydroxide@1.25kg/ha and Hexaconazole@1 lit/ha	331.3	8.82	11.84	35,200.00	65,120.00	29,920.00	1.85
SEM±	13.57	0.72	0.53				
CD(P=0.05)	28.91	1.53	1.13				
CV%	13.89	22.71	16.02				

Table 3: Performance of weedicides on performance indicators: Growth and Yield attributes

Technological Options	No. of Pod/Plant	Test weight(g)	Weed dry weight(g/m ²)			Weed control Efficiency (%)	Weed Index (%)
			15	10	25		
Pendimethalin 30% EC@ 1 kg ai./ha upto 3 days of sowing	180	25.88	15	10	25	62.68	9.5
Pendimethalin capsulated suspension @ 0.75 kg a.i./ha up to 3 days after sowing	210	27.43	9	8	19	71.64	27.13
Pendimethalin 30% EC@ 0.5 kg ai./ha + Imazethapyr @ 20 g ai at3 days after sowing	247	29.9	5	7	12	82.08	28.97
Weedy check	169	24.1	45	19	67		
SE d±	4.65	0.67				-	-
CD(P=0.05)	14.89	2.14	-	-	-	-	-

Table 4: Performance of weedicides on performance indicators: Yield and Economics

Technological Option	Grain Yield (q/ha)	Straw Yield (q/ha)	Cost of Cultivation (Rs./ha)	Net return		B:C ratio
				Gross return (Rs/ha)	(Rs/ha)	
Pendimethalin 30% EC@ 1 kg ai./ha upto 3 days of sowing	8.4	15.8	25,030	58,300	33,270	2.33
Pendimethalin capsulated suspension @ 0.75 kg a.i./ha up to 3 days after sowing	10.43	21.23	26,656	73,195	46,539	2.75
Pendimethalin 30% EC@ 0.5 kg ai./ha + Imazethapyr @ 20 g ai at3 days after sowing	10.70	22.44	26,896	75,420	48,524	2.80
Weedy check	7.6	16.43	24,732	53,815	29,083	2.18
SE d±	0.78	1.05	-	876.6	718	0.08
CD(P=0.05)	2.45	3.17		2,630	2,154	0.26

Conclusion

In the Tal area of Patna district, IPL-406 variety was observed to be higher yielding variety compared to HUL- 57, Arun and the local variety. In other experiment seed treatment with carbendazim, chlorpyrifos and Rhizobium culture, soil treatment with Trichoderma viridae and two alternate spray of copper hydroxide and Hexaconazole was observed to play very important role in increasing plant population, decreasing disease incidence and finally maximum yield of 11.84 q/ha compared to other trials. Weed also play an important role in reducing yield of lentil and use of Pendimethalin with Imazethapyr was observed to have maximum weed control efficiency resulting in highest yield of 22.44 q/ha. From above studies it can be concluded that overall management i.e. use of improved variety along with disease and weed control practices will increase the yield of lentil to a great extent and we will be able to meet the increasing demand of pulse by achieving self-sufficiently in Pulse production.

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