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Crop weed competition and control of weeds in potato

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Abstract

Field experiments were conducted at Vegetable research field of SKUAST-Kashmir during kharif seasons for two consecutive years 2015-16 and 2016-17 to study crop weed competition and to assess performance of various agronomic practices and herbicidal treatments on potato. The experiment consisted of seven treatments viz., T1; Weedy Check, T2; Weed Free, T3; Hand weeding at 30 days and weed free upto maturity, T4; Hand weeding at 40 days and weed free upto maturity, T5; Hand weeding at 50 days and weed free upto maturity, T6; Herbicides (Metribuzin @ 0.75kg/ha) pre-emergence, T7; Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence replicated thrice. Data pooled over two years indicated that the efficacy of different treatments was similar during both the years. Maximum yield was recorded in treatment weed free viz., 37.59 tha^{-1} . However, maximum net returns of Rs. 299209 and B:C ratio of 2.91 was recorded in treatment T7 viz., Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence. Among pre- and post-emergence Metribuzin treatments higher weed control efficiency was observed by the application of Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence.

Keywords: weed, herbicides, potato

Introduction

Potato is one of the most important commercial vegetable crops widely grown in India. In Jammu and Kashmir, it is widely cultivated over an area of about 2.092 thousand hectares with a production of about 37 thousand tonnes (Anonymous- 2015). Growth and development of potato and its tuber yield depends on biogenetic potential of a variety and cultural practices to which the crop is subjected. It should be grown under ideal environmental conditions for its potential tuber yield. There are several constraints in potato production, of which weeds often pose a serious problem. Potato though possesses robust growing and quick spreading habit, it is a very poor competitor with weeds because of its extremely slow growth in the initial emergence phase. Weeds not only compete with crop plants for nutrients, soil moisture, space and sun light but also serve as an alternative hosts for several insect pest and diseases. The yield reduction due to weeds in potato is estimated to be as high as 10-80 % (Lal and Gupta, 1984). So, control of weeds in the initial stages appears imperative as it plays an important role in maximizing the tuber production. Hand weeding and hoeing are common practices followed in India. However, timely weed control may not be possible due to non-availability of labours and high rate of wages during peak period of farm operations. Hence chemical weed control appears to hold a great promise in dealing with effective, timely and economic weed suppression. Keeping all these points in view the present investigation was planned to study the crop weed competition and influence of different herbicides on weed control efficiency and productivity of potato.

Materials and Methods

A field experiment was conducted at the experimental farm of the Division of Vegetable Science, SKUAST-Kashmir; Srinagar during kharif seasons for two consecutive years (2015-2016) to study the effect of different weedicides and hand weeding on weed control in potato crop. The soil texture of the field was clay loam with pH (7.20). The experiment was laid out in randomised block design with seven treatments viz., T1; Weedy Check, T2; Weed Free, T3; Hand weeding at 30 days and weed free upto maturity, T4; Hand weeding at 40 days and weed free upto maturity, T5; Hand weeding at 50 days and weed free upto maturity, T6; Herbicides (Metribuzin @ 0.75kg/ha) pre-emergence, T7; Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence replicated thrice. The herbicides were applied as per the prescribed treatments. The observations on weed count and weed

dry weight were taken at the harvest. Recommended package of practices were followed for raising the crop. Haulm cutting was done at 105 days after planting and harvesting of tubers was carried out 10 days after de-haulming.

Effect of various treatments on weed population

The data presented in Table 2 and 3 revealed that various agronomic and herbicidal treatments had a significant impact on weed population. Among different weed species, maximum initial population of *C. arvensis* was recorded viz; 6.33 weeds per m² during 2015 and 2016. And at harvest weedy check treatment recorded 9.33 weeds per m² of this weed, while as the herbicidal treatment of, Metribuzin @ 0.75kg/ha. post-emergence at 10% of plant emergence reduced this weed to 1.33 per m² Same herbicidal treatment was effective in reducing weed population of all the weeds under study. Similar results have been given by Tomer *et.al* (2008) and Channappagoudar (2007) in potato crop.

Results and Discussion

The major weed flora of the experimental field were *Cyperus*

rotundus and *Phalaris minor* among monocot weeds, while *Chenopodium album*, *Melilotus indica*, *Anagallis arvensis*, *Convolvulus arvensis* among dicot weeds. The study revealed that percent germination of potato was not affected by any of the treatments. However, the treatment with Hand weeding at 30, 40 and 50 days and weed free upto maturity significantly controlled weeds. The data presented in Table 1 revealed that maximum yield was recorded in treatment T2 i.e., weed free recording a yield of 37.59 tha⁻¹ These results could be attributed to the fact that the crop in this treatment was kept free of weeds resulting in no weed competition. This treatment was followed by hand weeding at 50 days and weed free upto maturity recording a yield of 35.88 tha⁻¹ showing that weed infestation upto 50 days of planting potato does not effect overall yield. However economic analysis of different weed control treatments revealed that application of herbicide Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence recorded maximum net returns (Rs. 299209) and B:C ratio (2.91). Similar results have been reported by Ken Davies (2007) in potato.

Table 1: Effect of various treatment on average tuber yield in potato

Treatment Combination	Average tuber yield(t/ha)			Net returns (Rs.)	B:C ratio over the years
	2015	2016	Mean		
Weedy Check	29.400	26.82	28.11	221404	2.45
Weed Free	38.220	36.96	37.59	302104	2.57
Hand weeding at 30 days and weed free upto maturity	36.720	34.36	35.54	288904	2.63
Hand weeding at 40 days and weed free upto maturity	35.160	33.98	34.57	281148	2.60
Hand weeding at 50 days and weed free upto maturity	37.10	34.66	35.88	299394	2.73
Herbicides (Metribuzin @ 0.75kg/ha) pre-emergence	33.200	32.88	33.04	286829	2.84
Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence	34.280	33.92	33.97	299209	2.91
CD at 5%	4.071		2.47	-	-
CV (%)	7.85		4.32	-	-

Table 2: Number of weeds/m² species-wise of potato as influenced by weed control treatments at 30 days after planting.

Treatment Combination	P. minor		M. indica		A. arvensis		C. arvensis		Cyperus rotundus	
	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
Weedy Check	4.33	3.66	1.66	1.33	2.33	2.66	6.33	6.33	0.33	0.66
Weed Free	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hand weeding at 30 days and weed free upto maturity	4.66	3.66	1.66	2.33	2.33	2.66	6.33	6.66	0.33	0.66
Hand weeding at 40 days and weed free upto maturity	4.33	3.66	1.66	2.33	2.33	2.66	6.33	6.66	0.66	0.66
Hand weeding at 50 days and weed free upto maturity	4.33	3.66	1.66	1.33	2.33	2.66	6.33	6.66	0.33	0.66
Herbicides (Metribuzin @ 0.75kg/ha) pre-emergence	1.66	1.66	0.33	0.33	0.66	1.33	0.66	0.33	0.66	0.66
Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence	1.33	1.33	0.33	0.33	0.33	0.66	0.33	0.33	0.33	0.33
CD at 5%	0.21	0.15	0.14	0.23	0.11	0.14	0.15	0.14	0.05	0.01

Table 3: Number of weeds/m² species-wise of potato as influenced by weed control treatments at Harvest.

Treatment Combination	P. minor		M. indica		A. arvensis		C. arvensis		Cyperus rotundus	
	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17	2015-16	2016-17
Weedy Check	8.66	9.33	4.35	3.98	8.33	8.33	9.33	9.33	7.33	7.33
Weed Free	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hand weeding at 30 days and weed free upto maturity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hand weeding at 40 days and weed free upto maturity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hand weeding at 50 days and weed free upto maturity	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicides (Metribuzin @ 0.75kg/ha) pre-emergence	1.66	1.66	1.66	1.66	1.66	0.66	2.33	2.66	1.33	1.33
Herbicides (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence	1.33	1.33	1.33	1.33	1.33	0.33	1.33	1.33	0.33	0.00
CD at 5%	0.35	0.25	0.34	0.11	0.24	0.14	0.33	0.11	0.12	0.11

Conclusion

From the data presented above, it can be inferred that maximum yield to the tune of 37.59 tha⁻¹ was recorded in treatment viz., Weed Free with net returns of Rs.302104 and B:C ratio of 2.57. However economic analysis revealed that

the application of herbicides viz., (Metribuzin @ 0.75kg/ha) post-emergence at 10% of plant emergence with maximum B:C ratio of 2.91. Keeping in view the higher economic returns by application of Metribuzin @ 0.75kg/ha post-emergence at 10% of plant emergence, this treatment may be

recommended for obtaining effective weed control, higher yield and economic gains.

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