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EFFECT OF DIFFERENT WEED CONTROL PRACTICES ON GRAIN AMARANTH (*Amaranthus hypochondriacus* L.)

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Abstract: A field experiment was conducted to find out suitable weed control method for higher yield of grain amaranth in Uttarakhand. Weed free treatment recorded significant improvement in plant height, yield attributes viz. number of fingers per inflorescence, inflorescence length and yield of grain amaranth (1117 kg/ha) followed by two hand weedings at 3 and 5 week after sowing (WAS). Among the herbicidal treatments, oxyfluorfen 50g/ha pre-emergent + one hand weeding (5 WAS) recorded higher seed yield (950 kg/ha) but the results were statistically indifferent from two hand weedings at 3 and 5 WAS. Weed control treatments had significant reduction in total weed dry weight and weed count over weedy check. Two hand weedings at 3 and 5 WAS had lowest weed count (30.67 / m2) and weed dry matter (11.0 g/m2) followed by oxyfluorfen 50g/ha pre-emergent + one hand weeding (5 WAS). Weed control efficiency (86 %) and B: C ratio (1.52) was also higher in two hand weeding at 3 and 5 WAS followed by oxyfluorfen 50g/ha pre-emergent + one hand weeding (5 WAS).
Keywords: Grain amaranth, economics, weed control, yield.

Introduction

Amaranth is one of the important underutilized crops in semi-arid tropics of Asia and Africa and often referred to as pseudo-cereal (Prasad *et* al. 2013). In India, it is cultivated in the hilly regions as well as in the plains, covering the entire Himalayas region, Southern India and in some parts of a Gujarat, Maharashtra, Orissa and Eastern Uttar Pradesh. In Uttarakhand, this crop occupies 6,572 ha area, with production of 3,285 tonnes and productivity of 500 kg/ha (FAI, 2012). Green leaf of amaranth is used as vegetable for human being and fodder for animals. The grains of this crop are used in quality human diet. This crop grows slowly in the first few weeks after germination and hence is very susceptible to weed competition (Kudask *et* al. 2012). Weed infestation reduces the seed yield of grain amaranth drastically. No herbicides are yet standardized to control weeds in grain amaranth. Weed control is presently done by inter row cultivation but the scarcity of labour is a problem. Suitable economic weed management practice for efficiently controlling weeds and higher grain yield of amaranth are

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essential for proper crop cultivation. In view of the above facts, an experiment was conducted to test the effect of various weed control practices on weeds and grain yield of amaranth.

Materials and methods

A field experiment was conducted during *kharif* season of 2011 and 2012 at Ranichauri, Uttarakhand. The soil of the experimental field was silty clay loam in texture, acidic in reaction (pH 5.6) and medium in available nitrogen, phosphorus and potassium, respectively. The climate of the region is subhumid with an annual average rainfall of 1263.8 mm. The experiment comprised of 8 treatments viz. weedy check, weed free, fenoxaprop ethyl 50g/ha post-emergent (3WAS), clodinofop ethyl 50g/ha post emergent (3WAS), oxyfluorfen 50g/ha pre-emergent, oxyfluorfen 50g/ha pre-emergent + one hand weeding (5WAS), oxadiargyl 50 g/ha post –emergent (3WAS), Two manual weeding 3 and 5 weeks after sowing (WAS) and one manual weeding (30DAS) was laid out in randomized block design with three replications. Grain amaranth variety PRA-3 was sown in first week of June in both the years. The crop was fertilized with 60 kg nitrogen, 40 kg phosphorus and 30 kg potash/ha. Half of the nitrogen and full amount of phosphorus and potash were applied as basal dose and remaining half of the nitrogen was applied at 60 DAS. The herbicides were sprayed with knapsack sprayer fitted with flat fan nozzle using 1000 litre of water for pre-emergence herbicides and 600 litre of water for post-emergence herbicides. Weed count and dry matter was recorded at 60 DAS after sowing from two randomly selected spots form each plot with the help of quadrate and expressed in number/m^2 and g/m^2, respectively. Data pertaining to weed count and dry weight were subjected to square root transformation ($\sqrt{x+0.50}$). Yields were harvested from net plot and treatment wise economics was computed based upon prevalent market price.

Results and discussion

Effect on weeds

The prominant weed species were viz. *Echinochloa colona*, *Eleusine indica*, *Commelina benghalensis*, *Oxalis latifolia*, *Oxalis corniculata* and *Cyperus rotundus* etc. Weed control treatments caused significant reduction in the total weed count (number /m^2) and weed dry weight (g/m^2) over weedy check at 60 DAS. Two manual weeding at 3 weeks and 5 weeks after sowing recorded significantly lower weed dry weight and total weed density at 60 DAS over other weed control treatments. Use of pre-emergence or post emergence herbicides did not reduce weed density/m^2 but weed dry weight was significantly lower in all weed control treatments as compare to weedy check. This may be because of continuous emergence of

weeds influenced the weed density but due to less dry weight of newly emerged weeds, dry weight was not affected. In other hand herbicides causes harmful effect on crop hence, crop was not able to compete with weeds. Amongst the treatments highest weed control efficiency (86.42) was recorded with two manual weeding at 3 and 5 weeks after sowing followed by oxyfluorfen 50 g/ha pre-emergent + one hand weeding (5WAS) and one hand weeding. This might be because of hand weeding at 30-35 DAS minimize the weed infestation effectively in comparison to pre and post emergence herbicides. Use of pre and post emergence herbicides in grain amaranth hampers the germination of crop and lesser crop density helps in weeds development (Kudask *et al*. 2012).

Effect on crop

Plant height (cm), yield attributes *viz.* number of fingers per inflorescence, inflorescence length (cm) and seed yield of grain amaranth were significantly affected by different weed control treatments. Weed free treatment recorded higher plant height which was significantly higher except two hand weeding at 3 and 5 WAS, one manual weeding at 30 DAS and oxyfluorfen 50g/ha pre-emergent + one hand weeding (5WAS). The number of finger per inflorescence and inflorescence length was higher in weed free treatment but at par with two hand weeding at 3 and 5 WAS. The seed yield (1117 kg/ha) was recorded in weed free treatment which was significantly higher in all treatments except two manual weedings at three and 5 WAS and oxyfluorfen 50 g/ha pre-emergent + one hand weeding (5WAS). The improved seed yield under weed free treatment was closely followed by two manual weeding at 3 and 5 week after sowing and oxyfluorfen 50g/ha pre-emergent + one hand weeding (5WAS). Higher seed yield under these treatments could be ascribed to better control of weeds which give competition free environment for better utilization of resources. Efficient utilization of resources under weed free situation favoured higher growth, yield attributing characters and ultimately higher seed yield of grain amaranth. Lowest seed yield 514 kg/ha was recorded under unweeded control. It was 54 % lower of weed free and 52% lower of two manual weeding at three and five WAS. The results of vigorous plant stand, greater yield and yield contributing characters have also been reported by Singh and Sairam (2016) and Kumar (2014), due to different weed control methods.

Economics

Highest net return (Rs 11035 /ha) and B:C ratio (1.52) was recorded when two manual weeding at 3 and 5 weeks after sowing were used. It was much closer to net return and B:C ratio recorded in oxyfluorfen 50g/ha pre-emergent + one hand weeding (5WAS) and one

hand weeding. Due to better weed control efficiency exhibited by various integrated approach of weed management greater monetary return along with net return, resultant high B:C ratio, have already worked by Murthy *et* al. (2007) and Tripathy *et* al. (2013).

Conclusion

On the basis of above study it may be concluded that two manual weeding at 3 and 5 weeks after sowing was found more efficient and economic practice in controlling weeds and producing higher seed yield of grain amaranth in hilly areas. In case of labour scarcity oxyfluorfen 50g/ha pre-emergent + one hand weeding (5WAS) or one hand weeding may be used as second alternative of weed control in grain amaranth.

Table 1. Effect of different weed management practice on plant height, yield contributing characters, weed density, weed dry weight, weed control efficiency, seed yield and economics in grain amaranth (pooled data of two years).

Treatments	Plant height (cm)	Number of fingers/ inflorescence	Inflorescence length (cm)	weed density (No./m^2)	Weed dry weight (g/m^2)	Weed control efficiency (%)	Seed yield (Kg/ha)	Net Returns	B:C ratio
Weedy check	116	18	26	230.67	81.00	0	514	1034	1.07
Weed free	192	45	57	0.00	0.00	100	1117	5118	1.18
Phenoxyprop ethyl 50g/ha post emergent (3WAS)	134	21	35	159.00	42.33	48	608	2430	1.15
Clodinofop ethyl 50g/ha post- emergent (3WAS)	126	22	25	177.33	48.00	41	592	1993	1.13
Oxyfluorfen 50g/ha preemergent	124	20	21	144.00	40.33	50	572	1859	1.12
Oxyfluorfen 50g/ha preemergent + one hand weeding (5WAS)	180	36	43	88.33	23.33	71	950	9192	1.48
Oxadiargyl 50 g/ha post – emergent (3WAS)	128	25	27	142.67	38.33	53	542	782	1.05
Two manual weeding at 3 and 5 WAS	180	43	52	30.67	11.00	86	1081	11035	1.52
One manual weeding (30DAS)	181	34	44	108.33	28.00	65	806	5784	1.31
CD (0.05)	22.3	6.9	5.6	0.48	0.43	-	103	-	-

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