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Effect of weed management practices on growth, yield and quality of Okra (*Abelmoschus esculentus* (L.) Moench) under temperate conditions of Kashmir valley

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Abstract

The present investigation was conducted during Kharif 2017 and 2018 at experimental field Division of Vegetable Sciences, SKUAST-Kashmir to assess the effect of weed management on growth, yield, and quality of Okra (*Abelmoschus esculentus* (L.) Moench) under temperate conditions of Kashmir valley. The trial was carried out in okra cv. Prabhani Kranti consisting of 7 treatments. T₁ = weedy check, T₂ = weed free check (two to three hand weeding), T₃ = Pre-emergence application of pendimethalin @ 6ml/lit, T₄ = Pre-emergence application of pendimethalin + one hand weeding, T₅ = Pre-emergence application of pendimethalin @ 6ml/lit + quizalofop ethyl @ 40-50gms/ha 20 days after sowing, T₆ = (Pre-emergence application of metribuzin @ 525g/ha) and T₇ = Post-emergence application of metalochlor @ 0.75kg ai/ha, replicated thrice with Randomized Block Design. Results revealed that amongst the treatments, treatment T₄ recorded maximum plant height (104.41cm), no. of primary leaves per plant (33.01), Pod length (14.65 cm), treatment T₃ recorded maximum number of pods per plant (14.50), average pod weight (11.97 g), and pod yield per ha (9.61 q ha⁻¹) while as quality parameters as TSS Brix⁰ (7.81), Vitamin C content (14.95 g/100 gm) and Protein content (1.75%) were found maximum with treatment T₄ also.

Keywords: Okra, pre-emergence, growth, and pod quality

Introduction

Okra (*Abelmoschus esculentus* (L.) Moench) is an important vegetable crop of the tropic and sub-tropic. It is grown during summer and rainy season and hence classified as warm season crop. It is a member of the Malvaceae family. Okra is quite popular in India because of easy cultivation, dependable yield and adaptability to varying moisture conditions. It is a versatile crop and considered as a lucrative vegetable used in fresh form as well as canned food. The root and stem are used for clearing cane juice in preparation of gur. The fruit also helps in cases of renal colic, leucorrhoea and general weakness. High iodine content of fruit helps in goiter. Besides the crop is also used in paper industry as well as for the extraction of fibre. Weed competition is especially dramatic in a direct-seeded vegetable like okra. The critical period of weed competition is usually longer in direct-seeded than in transplanted crops. Weed competition with the crop causes substantial yield losses (40-80%) which depends upon the type of weed flora, their intensity and stages (Sharma and Patel, 2011) [8]. The crop weed competition remains maximum during the early growth stage which slows initial growth rate of the crop and consequently causes poor competitive ability. Continuous monitoring and refinement in management strategies is essential for alleviating adverse effects of weeds on agricultural productivity and environmental health (Rao and Nagmani, 2013) [7]. Besides this, weeds are preferred by hosts of insect pests and vectors of many important organisms and thus act as a source of several diseases to okra. Therefore, it is greatly needed to evolve appropriate weed management strategy either through cultural or physical and mechanical or herbicidal or by combining herbicides with physical or mechanical and cultural weed control methods. Hence, the present investigation was designed to find out the effective measures of weed management with combination of herbicide and physical methods.

Materials and Methods

A field experiment was conducted during Kharif, 2017 and 2018 at experimental field Division of Vegetable Sciences, SKUAST-Kashmir. The experiment was laid in a randomised block design with three replications. The seeds of Okra cv. Prabhani Kranti were sown in May at a spacing of 60 × 45cms. Recommended package of practices were followed.

The plant protection measures were taken up to control pest and diseases as and when required along with intercultural operations.. In each plot 10 plants were tagged for taking all observations. Plant height, was recorded at final pickings in cm. Number of leaves per plant at full vegetative stage. Number of Pods plant⁻¹, were recorded by counting total no. of pickings. Pod length and Pod weight were estimated using average of ten pods from 10 tagged plants in centimetres and grams respectively. Pod yield was estimated on per plot basis

and converted in pod yield per hectare in quintals. T.S.S⁰ Brix was recorded with Digital Refractometers, ascorbic acid (mg/100g) content of pods from each treatment was determined by 2, 6 dichlorophenol indophenols visual titration method suggested by AOAC (1975) [1] and expressed in milligram per 100 g of fresh weight for all the treatment combinations in all replications. The protein content was calculated by multiplying a factor 6.25 (protein factor) with total nitrogen content in bulbs. Total nitrogen content in bulbs was determined by Kjeldahls method as outlined by Tandon (1993).

Data recorded were tabulated and statistically analysed as per Gomez and Gomez, 1976. Significant difference between treatment means was tested through 'F' test and critical difference (CD) was worked out wherever 'F' value was found to be significant for treatment effect.

The treatment details are	
T ₁ =	Weedy check
T ₂ =	Weed free check (two to three hand weedings)
T ₃ =	Pre-emergence application of pendimethalin @6ml/lt
T ₄ =	Pre-emergence application of pendimethalin @6ml/lt + one hand weeding
T ₅ =	Pre-emergence application of pendimethalin @6ml/lt + quizalofop ethyl@40-50gms/ha 20 days after sowing
T ₆ =	Pre-emergence application of metribuzin@525gms/ha
T ₇ =	Post emergence application of metalochlor@0.75kg ai/ha

Results and Discussion

Effect of weed management on growth and yield parameters of okra (*Abolmoschus esculentus Moench*) L.)

1. (Table-1 &Table -2)

The results of the present study showed that weed management has significantly affected the growth and yield attributes of okra. The effect of different treatments on the growth and yield parameters is described here as under:-

As per table -1 it was revealed that treatment T₄ = (Pre-emergence application of pendimethalin @6ml/lt + one hand weeding) recorded maximum plant height (104.41cms), no of leaves per plant (33.01) and pod length (14.65 cm) which was significantly superior to rest of other treatment but at par with treatment T₅ in case of plant height and pod length where as no. of leaves were at par with treatment T₂. Further as table-2 revealed that the maximum no of pods per plant (17.00) was found with treatment T₃ (Pre-emergence application of pendimethalin @6ml/lt) which was significantly superior to rest of all treatments but at par to treatment T₂ whereas maximum average pod weight (11.97 g) and pod yield (156.66 q ha⁻¹) were found with treatment T₂ (Weed free check (two to three hand weedings) which was significantly superior to rest of all treatments in case of pod yield whereas the values were at par with rest of all other treatments except treatment T-1.

These results are in agreement with Mekki *et al.*, (2010) [5]. The plant height varied significantly due to different treatments. Pre emergence application of pendimethalin @ 1.0 kg/ha + one hand weeding (T₄) showed superior performance in plant height than all other treatments tested except weed free check (T₂), with an plant height of (146.43 cm) indicating pre emergence application of pendimethalin + hand weeding practice had positive effect on the growth and development of okra followed by weed free check T₃ (143.80 cm). The lowest plant height (73.73 cm) was recorded in weedy check. The herbicides when used in combination with one or two hand weedings, improves their efficiency and the pre-emergent herbicides are beneficial to keep the crop weed free in the early stages. During later stages, hand weeding helps to reduce the cost of weeding and keep the weed population below the economic threshold level throughout the crop growth period. and also it might be due to the reason that, the crop faced minimum crop weed competition because of herbicidal action and hand weeding practice and it resulted into maximum values for growth, yield and yield related parameters. Rajasree *et al.* 2017 [6], Smith *et al.*, (2009) [9] and M. Baraiya *et al.* 2017 [4]. Punia *et al.* (2001), Yadav *et al.* (2002) [4] and Sukhadia *et al.* (2004), Awodoyin *et al.* (2009).

Table 1: Influence of weed management on growth and yield parameters of okra (*Abolmoschus esculentus Moench*) L.)

	Plant Height (cm)			No. of Leaves plant ⁻¹			Pod Length (cm)		
	(2017)	(2018)	pooled	2017	2018	pooled	(2017)	(2018)	pooled
T ₁ =	58.14	60.06	59.10	15.22	16.43	15.82	10.67	10.87	10.77
T ₂ =	69.85	71.34	70.60	33.36	31.51	32.43	12.62	12.47	12.54
T ₃ =	97.00	95.11	96.05	24.00	22.16	23.08	13.12	13.23	13.17
T ₄ =	105.19	103.64	104.41	34.02	32.00	33.01	14.50	14.80	14.65
T ₅ =	100.15	100.70	100.42	24.90	26.17	25.53	13.71	13.83	13.77
T ₆ =	66.00	66.56	66.28	21.28	22.67	21.97	13.10	13.15	13.12
T ₇ =	63.67	65.74	64.71	20.36	21.30	20.83	11.80	11.83	11.81
C.D≤0.5	4.23	5.01	4.62	4.36	4.88	4.62	1.00	0.97	1.02

Table 2: Influence of weed management on pod yield and yield related parameters of Okra.

	No. of pods/plant			Average pod Weight gms			(Pod Yield q/hac)		
	2017	2018	pooled	2017	2018	pooled	2017	2018	pooled
T ₁ =	10.63	11.65	11.14	8.60	8.57	8.58	56.28	58.26	57.27
T ₂ =	16.75	17.20	16.97	11.82	12.12	11.97	154.19	159.14	156.66
T ₃ =	16.00	18.01	17.00	9.53	10.20	9.86	101.44	105.05	103.24
T ₄ =	14.89	16.41	15.65	11.50	8.45	9.97	137.57	138.47	138.02
T ₅ =	15.22	16.85	16.03	11.67	12.02	11.84	135.57	136.58	136.07
T ₆ =	14.82	16.44	15.63	11.70	11.94	11.82	106.77	107.57	107.17
T ₇ =	13.04	15.04	14.04	10.87	11.44	11.15	104.22	101.21	106.75
C.D _{≤0.5}	1.33	1.63	1.48	0.85	4.12	2.12	8.60	10.80	8.90

2. Effect of weed management on quality parameters of okra (*Abelmoschus esculentus* Moench) L.) (Table -3)

Pooled analysis revealed that as per table-3 the treatment T₄ (Pre-emergence application of pendimethalin @6ml/lit + one hand weeding) recorded maximum T.S.S⁰ Brix (7.81), Vitamin C (14.95 mg /100 g) and protein content (1.75%) which was

significantly superior to rest of treatments but at par with treatment T₃, T₅ and T₆ in case of Vitamin C content, T₃ and T₅ in case of T.S.S Brix⁰ and with treatment T₃ in case of protein content. Similar reports were given by by Yadav *et al.* (2002)^[4] and Sukhadia *et al.* (2004), Awodoyin *et al.* (2009).

Table 3: Influence of weed management, on quality attributes of okra

	T.S.S (Brix)			Vitamin C mg/100 g			Protein content %		Pooled
	(2017)	(2018)	pooled	2017	2018	pooled	2017	2018	
T ₁ =	6.70	6.68	6.69	11.09	11.36	11.23	1.28	1.29	1.27
T ₂ =	7.26	7.24	7.25	12.97	13.04	13.00	1.45	1.47	1.46
T ₃ =	7.84	7.60	7.72	14.05	14.77	14.41	1.73	1.74	1.74
T ₄ =	7.71	7.90	7.81	14.84	15.06	14.95	1.75	1.75	1.75
T ₅ =	7.71	7.70	7.70	14.50	15.00	14.75	1.55	1.56	1.55
T ₆ =	7.12	7.13	7.12	13.90	14.55	14.22	1.63	1.63	1.63
T ₇ =	7.30	7.28	7.29	12.50	12.50	12.50	1.44	1.44	1.44
C.D _{≤0.5}	0.30	0.28	0.29	0.74	0.74	0.73	0.039	0.039	0.039

Conclusion

The results can be summarised as, the treatment T₄ (Pre-emergence application of pendimethalin @6ml/lit + one hand weeding) was recorded maximum values for most of the growth, yield, and quality parameters although Pod yield was found maximum with treatment T₂ (Weed free check (two to three hand weedings)). However further research trials should be carried in different locations to assess the best possible results.

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