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RESEARCH NOTE

Effect of integrated weed management on weed growth and yield of onion

Kanchan* and D.R. Chaudhary

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ABSTRACT

A field experiment was carried out during *Rabi*, 2024-2025 at the Vegetable Research Farm, Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya, Palampur. The objective of the study was to identify integrated weed management option to manage weeds and attain higher onion yield. There were twelve treatments, replicated thrice in randomized block design. The major weed flora associated with onion were: *Poa annua* (37.31%) followed by *Coronopus didymus* (16.55%), miscellaneous weeds (15.76%), *Euphorbia sp*. (11.94%), *Capsella bursa-pastoris* (9.34%) and *Gallinsoga parviflora* (9.1%). The weed free, pre-emergence application (PE) of pendimethalin 1.0 kg/ha followed by (*fb*) hand weeding (HW) twice at 45 and 70 days after transplanting (DAT) onion and post-emergence application (PoE) of oxyfluorfen 0.15 kg/ha *fb* HW twice at 45 and 70 DAT, efficiently reduced the density and biomass of different weed species with higher highest weed control efficiency at 90 DAT. It is concluded that effective and economical weed management and higher onion yield can be obtained with pendimethalin 1.0 kg/ha PE *fb* HW twice at 45 and 70 DAT.

Keywords: Onion, Oxyfluorfen, Pendimethalin, Weed free, Weed control efficiency

Onion (*Allium cepa* L.), a member of the family Amaryllidaceae, is one of the important vegetable crops grown all over the globe. In India, onion is being grown on an area of 1.53 million hectares with production of 25.47 million tons and the productivity is about 16.64 tons/hectare (Anonymous 2023). Onion is more vulnerable to weed competition than many other crops because of its short statured plants, less canopy formation, limited foliage, shallow roots, slow initial crop growth and prolonged growth period. Although, hand weeding is effective but it is more labour-intensive, time-consuming and economically unviable under many circumstances. Consequently, the application of both pre-emergence and post-emergence herbicides individually or in combination, presents a viable option for farmers to minimize crop-weed competition during both early and later stages of crop growth. In many instances, farmers are unable to apply pre-emergence herbicides in a timely manner. Therefore, identifying suitable post-emergence herbicides or their combinations supplemented with hand weeding are essential for managing the complex weed flora. Thus, this study was conducted with an objective to identify integrated weed management option with post-emergence herbicides as a component to manage weeds and attain higher onion yield.

Department of Vegetable Science & Floriculture, CSK HPKV Palampur, Himachal Pradesh 176062, India

* Corresponding author email: kanchanbarjatia@gmail.com

MATERIALS AND METHODS

The soil of mid-hill conditions of Palampur was of podzolic type with pH range of 5.0-6.0. The experiment with 12 treatments was laid out in randomized block design with 3 replications. Two herbicides and their combinations tested include: pre-emergence application (PE) of pendimethalin 1.0 kg/ha, pendimethalin 1.5 kg/ha PE, pendimethalin 1.0 kg/ha PE followed by (*fb*) hand weeding (HW) at 45 days after transplanting (DAT), pendimethalin 1.0 kg/ha PE *fb* HW twice at 45 and 70 DAT, post-emergence application (PoE) of oxyfluorfen 0.15 kg/ha, oxyfluorfen 0.25 kg/ha PoE, oxyfluorfen 0.15 kg/ha PoE *fb* HW at 45 DAT, oxyfluorfen 0.15 kg/ha PoE *fb* HW twice at 45 and 70 DAT, pendimethalin 1.0 kg/ha PE *fb* oxyfluorfen 0.15 kg/ha PoE, HW twice at 45 and 70 DAT, weed free and weedy check. Pre-emergence application of pendimethalin was done two days before transplanting and the post-emergence spray of oxyfluorfen was done on December 30, 2024. Onion variety *'Palam Lohit'* was transplanted at a spacing of 15 x 10 cm on December 9, 2024. Observations on species-wise weed density, total weed biomass at 30, 60, 90, 120 days after transplanting (DAT) and at harvest were taken and weed control efficiency was also calculated for 60, 90 and 120 DAT. A quadrat of 25 x 25 cm was placed randomly at two spots in each plot and the

species-wise weed count (density) was recorded and the average density was calculated as no./m^2. The crop was harvested on May 23, 2025. The data of weed density and biomass were subjected to square root transformation *i.e.* $\sqrt{(x+0.5)}$ prior to statistical analysis.

RESULTS AND DISCUSSION

The experimental field was predominated by *Poa annua*, *Coronopus didymus*, *Euphorbia* sp., *Capsella bursa-pastoris*, *Gallinsoga parviflora* and miscellaneous weeds. All the weed management treatments resulted in significant reduction of weed flora at different stages of observation (**Table 1** and

Table 1. Effect of weed management treatments on density (no./m^2) of different weeds at 60 and 120 days after transplanting (DAT) onion

Treatment	*Poa annua*		*Coronopus didymus*		*Euphorbia* sp.		*Capsella bursa-pastoris*		*Gallinsoga parviflora*	
	60 DAT	120 DAT	60 DAT	120 DAT	60 DAT	120 DAT	60 DAT	120 DAT	60 DAT	120 DAT
Pendimethalin PE 1.0 kg/ha	12.19 (148.10)	7.99 (63.34)	7.68 (58.52)	8.59 (73.29)	7.32 (53.08)	7.32 (53.08)	6.97 (48.08)	6.90 (47.11)	6.54 (42.27)	6.97 (48.08)
Pendimethalin PE 1.5 kg/ha	11.29 (126.96)	7.32 (53.08)	6.97 (48.08)	8.30 (68.39)	6.90 (47.11)	6.96 (47.94)	6.90 (47.11)	6.54 (42.27)	6.12 (36.95)	6.54 (42.27)
Pendimethalin PE 1.0 kg/ha *fb* HW 45 DAT	6.92 (47.37)	6.12 (36.95)	5.32 (27.80)	6.29 (39.06)	4.65 (21.12)	6.34 (39.70)	5.20 (26.54)	5.15 (26.02)	5.15 (26.02)	5.87 (33.96)
Pendimethalin PE 1.0 kg/ha *fb* HW twice at 45 and 70 DAT	6.14 (37.20)	4.61 (20.75)	4.61 (20.75)	4.35 (18.42)	4.36 (18.51)	4.65 (21.12)	4.61 (20.75)	5.03 (24.8)	4.90 (23.51)	4.65 (21.12)
Oxyfluorfen PoE 0.15 kg/ha	15.83 (250.03)	15.15 (229.02)	7.92 (62.23)	8.30 (68.39)	7.68 (58.52)	8.03 (63.98)	7.32 (53.08)	7.32 (53.08)	6.90 (47.11)	7.67 (58.33)
Oxyfluorfen PoE 0.25 kg/ha	16.00 (255.5)	14.06 (197.18)	7.68 (58.52)	8.94 (79.42)	7.32 (53.08)	7.99 (63.34)	7.25 (52.06)	7.15 (50.62)	7.32 (53.08)	8.05 (64.30)
Oxyfluorfen PoE 0.15 kg/ha *fb* HW 45 DAT	5.92 (34.55)	6.76 (45.20)	4.95 (24.00)	6.29 (39.06)	4.61 (20.75)	6.29 (39.06)	4.90 (23.51)	5.58 (30.64)	5.58 (30.64)	6.14 (37.20)
Oxyfluorfen PoE 0.15 kg/ha *fb* HW twice at 45 and 70 DAT	5.89 (34.19)	5.45 (29.20)	5.15 (26.02)	5.15 (26.02)	4.36 (18.51)	4.60 (20.66)	5.15 (26.02)	4.90 (23.51)	4.65 (21.12)	4.90 (23.51)
Pendimethalin PE *fb* oxyfluorfen PoE 1.0 *fb* 0.15 kg/ha	8.51 (71.94)	6.54 (42.27)	6.00 (35.50)	7.13 (50.34)	5.70 (31.99)	7.01 (48.64)	6.54 (42.27)	5.87 (33.96)	5.92 (34.55)	6.90 (47.11)
Hand weeding (HW) twice at 45 and 70 DAT	5.67 (31.65)	5.89 (34.19)	5.20 (26.54)	5.32 (27.80)	4.06 (15.98)	5.20 (26.54)	4.06 (15.98)	4.61 (20.75)	4.95 (24.00)	4.61 (20.75)
Weed free	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)	0.71 (0.0)
Weedy check	19.01 (360.88)	17.04 (289.86)	12.97 (167.72)	13.26 (175.33)	9.54 (90.51)	10.35 (106.62)	9.54 (90.51)	10.08 (101.11)	7.68 (58.51)	10.22 (103.95)
LSD (p=0.05)	1.53	1.35	1.53	1.60	1.04	1.26	1.17	1.49	1.03	1.25

Value in parentheses are the means of original values, DAT= days after transplanting, PE: pre-emergence, PoE: post-emergence

Table 2. Effect of weed management treatments on total weed biomass and weed control efficiency at different stages of onion growth

Treatment	Total weed biomass (g/m^2)					Weed control efficiency (%)		
	30 DAT	60 DAT	90 DAT	120 DAT	At harvest	60 DAT	90 DAT	120 DAT
Pendimethalin PE 1.0 kg/ha	1.1(0.8)	14.2(200.9)	15.0(224.5)	14.6(213.0)	13.5(182.3)	75.90	77.55	71.70
Pendimethalin PE 1.5 kg/ha	1.1(0.8)	14.1(197.7)	14.3(204.6)	13.9(194.1)	12.8(162.3)	76.28	79.54	74.21
Pendimethalin PE 1.0 kg/ha *fb* HW 45 DAT	1.2(0.9)	7.8(60.3)	13.8(176.4)	12.9(166.9)	10.6(112.9)	92.76	82.36	77.82
Pendimethalin PE 1.0 kg/ha *fb* HW twice at 45 and 70 DAT	1.2(1.0)	7.7(58.6)	3.2(9.5)	4.8(22.9)	4.5(19.4)	92.96	99.05	96.95
Oxyfluorfen PoE 0.15 kg/ha	3.5(12.0)	25.7(662.0)	27.5(755.7)	25.7(661.0)	19.1(364.6)	20.57	24.42	12.16
Oxyfluorfen PoE 0.25 kg/ha	4.5(19.4)	24.0(574.1)	26.3(694.1)	21.9(480.7)	15.3(234.2)	31.13	30.58	36.12
Oxyfluorfen PoE 0.15 kg/ha *fb* HW 45 DAT	4.4(18.9)	8.6(74.6)	14.0(196.1)	13.8(190.8)	12.8(162.6)	91.04	80.39	74.64
Oxyfluorfen PoE 0.15 kg/ha *fb* HW twice at 45 and 70 DAT	4.2(17.6)	9.0(80.5)	5.7(32.2)	5.9(28.9)	4.9(19.1)	90.34	96.78	96.15
Pendimethalin PE *fb* oxyfluorfen PoE 1.0 *fb* 0.15 kg/ha	1.2(0.9)	10.6(109.3)	14.6(199)	13.3(175.9)	11.1(122.2)	86.88	80.09	76.63
Hand weeding (HW) twice at 45 and 70 DAT	4.5(19.6)	7.9(62.7)	5.8(33.7)	9.6(83.2)	9.1(82.9)	92.48	96.63	88.95
Weed free	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	0.7(0.0)	-	-	-
Weedy check	4.1(16.6)	28.9(833.5)	31.6(999.9)	27.4(752.5)	19.9(393.5)	-	-	-
LSD (p=0.05)	0.24	1.35	1.55	1.48	1.22			

Value in parentheses are the means of original values, DAT= days after transplanting, PE: pre-emergence, PoE: post-emergence; *fb* = followed by

Table 3. Effect of weed management treatments on economics in onion

Treatment	Bulb yield (t/ha)	Gross returns (x10^3 INR/ha)	Cost of cultivation (x10^3 INR/ha)	Net returns (x10^3 INR/ha)	B:C ratio
Pendimethalin PE 1.0 kg/ha	11.59	231.88	116.45	115.43	0.99
Pendimethalin PE 1.5 kg/ha	11.94	238.78	117.93	120.85	1.02
Pendimethalin PE 1.0 kg/ha *fb* HW 45 DAT	20.45	409.00	138.73	270.26	1.95
Pendimethalin PE 1.0 kg/ha *fb* HW twice at 45 and 70 DAT	24.96	499.12	154.45	344.67	2.23
Oxyfluorfen PoE 0.15 kg/ha	5.51	110.30	107.01	3.29	0.03
Oxyfluorfen PoE 0.25 kg/ha	8.12	162.50	110.48	52.02	0.47
Oxyfluorfen PoE 0.15 kg/ha *fb* HW 45 DAT	14.75	295.06	129.42	165.64	1.28
Oxyfluorfen PoE 0.15 kg/ha *fb* HW twice at 45 and 70 DAT	20.93	418.66	147.69	270.97	1.83
Pendimethalin PE *fb* oxyfluorfen PoE 1.0 *fb* 0.15 kg/ha	16.42	328.44	125.36	203.07	1.62
Hand weeding (HW) twice at 45 and 70 DAT	20.76	415.12	145.75	269.37	1.85
Weed free	28.71	574.30	202.74	371.55	1.83
Weedy check	0.98	19.56	98.09	-	-
LSD (p=0.05)	2.71	-	-		

fb= followed by, DAT= days after transplanting, PE: pre-emergence application, PoE: post-emergence application

2). The minimum density of *Poa annua*, *Coronopus didymus*, *Euphorbia* sp., *Capsella bursa-pastoris*, *Gallinsoga parviflora* and miscellaneous weeds; maximum weed control efficiency at all the growth stages studied was recorded with weed free, pendimethalin 1.0 kg/ha PE *fb* HW twice at 45 and 70 DAT and oxyfluorfen 0.15 kg/ha PoE *fb* HW twice at 45 and 70 DAT confirming findings of Rajkumara and Palled (2009) and Vashi *et al.* 2012. The maximum onion bulb yield and benefit cost ratio was observed with weed free, which was followed by pendimethalin 1.0 kg/ha PE *fb* HW twice at 45 and 70 DAT (**Table 3**) confirming Paikra and Kumar (2025).

It is concluded that effective and economical weed management and higher onion yield can be obtained with pendimethalin 1.0 kg/ha PE *fb* HW twice at 45 and 70 DAT.

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