Research Paper :

Influence of various weed control methods on growth and yield contributing character of onion seed

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International Journal of Plant Protection (April, 2010), Vol. 3 No. 1 : 23-27

SUMMARY

The experiment on influence of various weed control methods on growth and yield contributing character of onion seed crop was laid out in Randomised Block Design with three replications. Onion seed crop was grown in ridges and furrow layout and in eight treatments. An experimental soil was clayey in texture, low in available N (241.41 kg ha^{-1}), medium in available phosphorus (19.81 kg ha^{-1}) and moderately rich in available potassium (350.50 kg ha^{-1}). The plant population at 30 days after planting and at harvest was not influenced by different herbicide treatment. The plant height was also not influenced by herbicides upto 60 DAP but at later stage, it was significantly more in weed free treatment followed by oxyfluorfen @ 0.25 kg a.i. ha^{-1} among the herbicidal treatments. Within the treatments of herbicides coupled with hand weeding more height was observed in oxyfluorfen @ 0.1875 kg a.i. ha^{-1} followed by oxadiargyl @ 0.0675 kg a.i. ha^{-1}. The dry matter accumulation per plant was observed to be significantly more in weed free check followed by oxyfluorfen @ 0.1875 kg ha^{-1} coupled with one hand weeding. The accumulation of dry matter was less in unweeded control. The seed weight per umbel, test weight and seed yield were found to be significantly higher in weed free check followed by oxyfluorfen @ 0.1875 kg ha^{-1} + one hand weeding. Among the herbicide treatments oxyfluorfen @ 0.25 kg ha^{-1} recorded higher seed weight per umbel, test weight and seed yield followed by oxadiargyl @ 0.09 kg ha^{-1}. The integration of oxyfluorfen @ 0.1875 kg a.i. ha^{-1} along with one hand weeding showed higher benefit : cost ratio followed by oxadiargyl @ 0.0675 kg a.i. ha^{-1} coupled with hand weeding. Integrated weed management of oxyfluorfen (PE) @ 0.1875 kg a.i. ha^{-1} in conjugation with one hand weeding at 30 DAP was the most viable proposition in controlling weeds in onion seed crop and increasing the seed yield and net monetary returns, followed by oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1} +one hand weeding at 30 days after planting.

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Key words : Weed control method, Growth character, Onion yield

Accepted : December, 2009

Onion is a biennial crop, it produces bulbs in first season and seed in the succeeding season. Onion seed production is done largely under subtropical climate which is influenced by cultivars, bulb weight, soil, spacing, fertilizers and date of planting. Secondly, onion seed has poor keeping quality and losses in vigour and viability. Therefore, it is essential to produce fresh seed every year for the next sowing (Tomar, 2001).

It is essential to produce fresh seed every year for the next sowing. Limited availability of quality seed is due to high incidence of diseases and pests over the seed crop. Purity of seed is less due to its highly cross pollination and the use of self seed saved for raising the onion crop. Adequate supply of high quality seed free from noxious weeds is the basic need for increasing the production of onion bulb. Amongst the different constraints in the production of onion, management of weeds is one of the most important factor. Weeds compete severely with crop for essential plant nutrients, space, sunlight and moisture. Thus, it reduces the bulb yield from 48 to 85 per cent depending upon the duration of the crop, weed competition, weather condition and intensity of weeds (Bhalla, 1978). In view of this, the present investigation was carried out to study the Influence of various weed control methods on growth and yield contributing character of onion seed.

MATERIALS AND METHODS

The experiment was conducted during *Rabi* season on Central Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri. Dist. Ahmednagar (Maharashtra). It lies between 19^0 48'N and 19^0 57' N latitude and between 74^0 35' E and 74^0 18'E longitude. The altitude varies from 495 to 569 meters above mean sea level. The soil of the experimental area was well drained with more than 1 m depth. There were eight treatments *viz.,* spraying of oxyfluorfen (PE)

@ 0.25 kg a.i. ha^{-1}, fluchloralin (PE) @ 1 kg a.i. ha^{-1} oxadiargyl (PE) @ 0.09 kg a.i. ha^{-1}, oxyfluorfen (PE) @ 0.1875 kg a.i. ha^{-1} + one hand weeding at 30 DAP, fluchloralin (PE) @ 0.75 kg a.i. ha^{-1} + one hand weeding at 30 DAP, oxadiargyl (PE) @ 0.0675 kg a.i. ha^{-1} + one hand weeding at 30 DAP, weed free treatment (weed free up to 70 days after planting) and weedy check. The gross and net plot sizes were 4.50 x 3.60 m^2 and 3.90 x 2.40 m^2. Good quality bulbs of N-2-4-1 variety of onion was used. The seed bulbs were treated with Bavistin and 0.5 per cent monocrotophos before planting. The one fourth portion of top was cut by sickle before planting. The treated bulbs were planted in ridges and furrows opened at 60 cm apart and spacing between two bulbs was 30 cm. At the time of planting the basal dose of 50 kg N, 50 kg P_2O_5 and 50 kg K_2O ha^{-1} along with 20 t FYM ha^{-1} was applied uniformly. The remaining dose of 100 kg N ha^{-1} was applied in two equal splits at 30 and 60 DAP as top dressing. The various treatments on plant characters the biometric observations were recorded at regular interval of 30 days throughout the life period of onion seed crop. Climatologically, this area falls in the scarcity zone (semi-arid tropics) with an annual rainfall ranging from 317 to 619 mm. The average annual rainfall is 520 mm. The data recorded were statistically analysed by using technique of analysis of Variance (Fisher, 1970) and significance was determined as given by Panse and Sukhatme (1985) for Randomized Block Design.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been sumarrized under following heads :

Plant population :

The initial plant population at 20 DAP final plant population at harvest and per cent population as influenced by different herbicide treatments are presented in Table 1. The initial and final plant population per plot was found significant in onion seed production by the use of oxyfluorfen, fluchloralin and oxadiargyl pre-emergance herbicides @ 0.25, 0.1 and 0.09 kg a.i. ha^{-1}, respectively and similar herbicides with reduced dose coupled with one hand weeding at 30 DAP. Thus, the application of oxyfluorfen, fluchloralin and oxadiargyl (pre-emergence) alone and these herbicides with reduced dose along with one hand weeding had no adverse effect on initial plant population and per cent theoretical population of onion seed crops.

Plant height :

The observation on plant height of onion seed crop is presented in Table 2. The height of onion seed crop was found significant at 60 DAP and at harvest, whereas it was not significant at 30 and 60 DAP due to different herbicide treatments. This might be because of the application of herbicide concentration retards the growth at early age of crop plants. At 90 DAP among the herbicide treatments, application of oxyfluorfen @ 0.1875 kg a.i.

Table 1 : Mean initial and final plant population per plot as influenced by different treatments.

Treatments		Initial plant population per plot at 20 DAP	Per cent to theoretical population	Final plant population per plot at harvest	Per cent to theoretical population
T_1 :	Oxyfluorfen (P.E.) @ 0.25 kg a.i. ha^{-1}	50.00	96.15	51.66	99.35
T_2 :	Fluchloralin, (P.E.) @ 1 kg a.i. ha^{-1}	48.33	93.58	52.00	100.00
T_3 :	Oxadiargyl, (P.E.) @ 0.09 kg a.i. ha^{-1}	50.66	95.51	51.33	98.71
T_4 :	Oxyfluorfen, (P.E.) @ 0.1875 kg a.i. ha^{-1} + one HW at 30 DAP)	51.33	98.71	52.00	100.00
T_5 :	Fluchloralin, (P.E.) @ 0.75 kg a.i. ha^{-1} + one HW at 30 DAP)	48.66	93.58	51.66	99.35
T_6 :	Oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1} + one HW at 30 DAP	47.66	92.99	51.33	98.71
T_7 :	Weed free (up to 70 DAP)	49.00	94.22	51.33	98.71
T_8 :	Weedy check	47.66	91.66	51.00	98.07
S.E. ±		1.51	3.10	0.44	0.92
C.D. (P=0.05)		NS	NS	NS	NS
Mean		49.16	94.55	51.54	99.11

PE = Pre- emergence DAP = Days after planting NS = Non significant

Table 2 : Mean plant height (cm) at various growth stages as influenced by different treatments

Treatments	Days after planting			
	30	60	90	At harvest
T_1 : Oxyfluorfen (P.E.) @ 0.25 kg a.i. ha^{-1}	6.56	32.30	73.97	81.71
T_2 : Fluchloralin, (P.E.) @ 1 kg a.i. ha^{-1}	6.56	32.16	71.38	79.47
T_3 : Oxadiargyl, (P.E.) @ 0.09 kg a.i. ha^{-1}	6.54	32.04	73.76	81.57
T_4 : Oxyfluorfen, (P.E.) @ 0.1875 kg a.i. ha^{-1} + one HW at 30 DAP)	6.63	30.57	75.66	86.61
T_5 : Fluchloralin, (P.E.) @ 0.75 kg a.i. ha^{-1} + one HW at 30 DAP)	6.59	30.81	74.32	82.51
T_6 : Oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1} + one HW at 30 DAP	6.58	30.76	75.64	83.62
T_7 : Weed free (up to 70 DAP)	6.95	33.34	79.78	88.17
T_8 : Weedy check	6.94	30.42	67.02	68.72
S.E. ±	0.59	0.89	1.12	2.57
C.D. (P=0.05)	NS	NS	3.42	7.81
Mean	6.67	31.55	73.94	81.55

PE = Emergence DAP = Days after planting
NS = Non significant

ha^{-1} + one hand weeding at 30 DAP recorded significantly higher plant height, however, it was found at par with all the remaining herbicide treatments except fluchloralin @ 1.0 kg a.i. ha^{-1}. Similar trend was noticed at harvest.

The height of onion seed crop was significantly higher in weed free check could be due to no weed competition and lower height in weedy check due to continuous competition of weeds which reduced the growth of plants due to poor exposure to sunlight. Similar observations were recorded by Manjunath *et al*. (1989) and Vedprakesh *et al*. (2000).

Days to 50 % flowering :

The data in respect to days required to 50 per cent flowering of onion seed as influenced by treatments are reported in Table 3. Application of pre emergence herbicide oxfluorfen @ 0.875 kg a.i. ha^{-1} + one hand weeding at 30 DAP recorded minimum number of days to 50 per cent flowering. However it was at par with oxfluorfen alone @ 0.25 kg a.i. ha^{-1}. Maximum number of days required to 50 per cent flowering was observed in weedy check treatment. The application of herbicide alone used to control the weeds required more days to 50

Table 3 : Mean number of days for 50 per cent flowering and plant dry matter at harvest

Treatments	Days to 50 % flowering	Dry matter (g plant^{-1})
T_1 : Oxyfluorfen (P.E.) @ 0.25 kg a.i. ha^{-1}	54.71	39.33
T_2 : Fluchloralin, (P.E.) @ 1 kg a.i. ha^{-1}	58.09	37.33
T_3 : Oxadiargyl, (P.E.) @ 0.09 kg a.i. ha^{-1}	56.38	38.60
T_4 : Oxyfluorfen, (P.E.) @ 0.1875 kg a.i. ha^{-1} + one HW at 30 DAP)	50.33	41.46
T_5 : Fluchloralin, (P.E.) @ 0.75 kg a.i. ha^{-1} + one HW at 30 DAP)	52.22	39.66
T_6 : Oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1} + one HW at 30 DAP	51.57	40.00
T_7 : Weed free (up to 70 DAP)	49.99	78.80
T_8 : Weedy check	58.54	35.53
S.E. ±	1.56	2.89
C.D. (P=0.05)	4.74	8.77
Mean	53.98	43.84

PE = Pre- emergence DAP = Days after planting

per cent flowering in onion seed crops. This might be because of might have some retarding effect of herbicide on vegetative growth, which delayed the period of flowering. Thus, use of pre-emergence application of oxyfluorfen, fluchloralin and oxadiargyl along with one hand weeding was beneficial for reduction in days to 50 per cent flowering.

Plant dry matter :

The data pertaining to dry matter production of onion seed crop at harvest as influenced by different treatments are presented in Table 3. The dry matter production of onion seed crop was found significantly higher in weed free treatment. However, the herbicidal treatments and weedy check were at par with each other in respect of dry matter production of onion seed crop at harvest. The higher dry matter production of onion seed crop in weed free treatment might be because of in weed free treatment the conservation of moisture and nutrients which was utilized by the onion seed crop for assimilation of dry matter during the growth period. These observations are in confirmity with the findings of Prasad and Singh (1988) and Kathepuri (2003). The dry matter production of herbicide treatments and weedy check was reduced almost up to half the dry matter of weed free treatment. The dry matter of herbicide treatments was ranged

between 35.53 – 41.46 g plant^{-1} and in weed free treatment it was 78.80 g plant^{-1}. This variation might be because of loss of moisture and nutrients in herbicide treatments by the weeds. These results are in confirmity with the findings of Khurana *et al*. (1985).

Yield contributing characters and yield of onion seed:

The data pertaining to yield contributing characters and seed yield of onion as influenced by different treatments are presented in Table 4. The number of umbels per bulb was observed to be a not-significant due to different treatments of herbicide alone and herbicides + one hand weeding at 30 DAP as well as weed free treatment and weedy check. Numerically, the weed free treatment recorded the higher number of umbels per bulb and lower in weedy check and fluchloralin (PE) @ 0.75 kg a.i. ha^{-1} + one hand weeding at 30 DAP. The mean diameter of umbel was found to be not-significant due to different treatments of herbicides alone and herbicides + one hand weeding at 30 DAP as pre emergence herbicide as well as weed free treatment and weedy check. However, weed free treatment recorded more umbel diameter and comparatively it was less in weedy check. Thus, the use of pre-emergence herbicide *viz.*, oxyfluorfen, fluchloralin and oxadiargyl did not influence the number of umpels and diameter of umbel of onion seed crop.

Seed weight per bulb:

The weed free treatment showed its superiority by recording significantly higher seed weight per bulb. Whereas, weedy check recorded significantly the least weight of seed per bulb. Among the treatments of herbicides alone, application of oxyfluorfen (P.E.) @ 0.25 kg a.i. ha^{-1} recorded significantly higher seed weight than fluchloralin (P.E.) @ 1 kg a.i. ha^{-1} and it was at par with oxadiargyl (P.E.) @ 0.09 kg a.i. ha^{-1}. However, application of oxyfluorfen (PE) @ 0.1875 kg a.i. ha^{-1} + one hand weeding at 30 DAP recorded significantly higher seed weight per bulb than herbicide alone treatment and weedy check but it was at par with oxadiargyl @ 0.09 kg a.i. ha^{-1} and fluchloralin @ 0.75 kg a.i. along with one hand weeding at 30 DAP. Similar findings were reported by Randhawa *et al*. (1985), Semidey and Carabollo (1989) and Singh *et al*. (1998). The variation in seed weight per bulb by the various treatments might be because of efficiency of controlling weeds by the treatments and reducing the competition of onion seed crop and weeds for nutrients, moisture sunlight and space for root development in soil. Similar results were also reported by Malik *et al*. (1982), Shah *et al*. (1996) and Kathepuri (2003). Use of oxyfluorfen (P.E.) @ 0.1875 kg a.i. ha^{-1} + one hand weeding at 30 DAP was found beneficial for seed weight per bulb in onion seed crop followed by oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1}.

Test weight :

Weed free treatment registered significantly higher test weight of onion seed as compared to rest of the treatments (Table 4). Among the herbicide treatments application of oxyfluorfen @ 0.1875 kg a.i. ha^{-1} + one hand weeding at 30 DAP recorded significantly higher test weight, however, it was at par with rest of the herbicide treatments.

Seed yield :

Weed free treatment registered significantly highest

Table 4 : Yield contributing characters and yield of onion seed as influenced by different treatments

Treatments		Number of umbel per bulb	Diameter of umbel (cm)	Seed weight per bulb (g)	Test weight (g)	Seed yield (q/ha^{-1})
T_1 :	Oxyfluorfen (P.E.) @ 0.25 kg a.i. ha^{-1}	6.26	6.13	9.59	3.69	5.26
T_2 :	Fluchloralin, (P.E.) @ 1 kg a.i. ha^{-1}	6.13	6.06	7.84	3.50	4.34
T_3 :	Oxadiargyl, (P.E.) @ 0.09 kg a.i. ha^{-1}	6.13	6.13	8.80	3.58	4.91
T_4 :	Oxyfluorfen, (P.E.) @ 0.1875 kg a.i. ha^{-1} + one HW at 30 DAP)	6.53	6.32	10.00	3.78	5.80
T_5 :	Fluchloralin, (P.E.) @ 0.75 kg a.i. ha^{-1} + one HW at 30 DAP)	5.93	6.18	9.60	3.65	5.33
T_6 :	Oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1} + one HW at 30 DAP	6.46	6.28	9.86	3.65	5.43
T_7 :	Weed free (up to 70 DAP)	7.00	6.83	14.13	4.80	8.49
T_8 :	Weedy check	5.93	6.03	6.42	3.38	3.57
S.E. ±		0.40	0.190	0.35	0.175	0.41
C.D. (P=0.05)		NS	NS	1.06	0.529	1.25
Mean		6.30	6.24	9.69	3.797	5.35

PE = Pre- emergence DAP = Days after planting NS = Non significant

seed yield of onion as compared to rest of the treatments. Among the treatments of herbicides application of oxyfluorfen (P.E.) @ 0.25 kg a.i. ha^{-1} registered maximum seed yield of onion than fluchloralin @ 1 kg a.i. ha^{-1} and oxadiargyl @ 0.09 kg a.i. ha^{-1}. Further enhancement in seed yield was observed with application of herbicide coupled with one hand weeding 30 days after planting. These observations indicate that the application of pre-emergence herbicide oxyfluorfen, fluchloralin and oxadiargyl alone and coupled with one hand weeding 30 days after planting is beneficial. The above findings are in confirmity with the findings of Singh *et al.* (1986), Manjunath *et al.* (1989), Singh *et al.* (1998) and Kathepuri (2003). Thus, application of oxyfluorfen (P.E.) @ 0.1875 kg a.i. ha^{-1} or oxadiargyl (P.E.) @ 0.0675 kg a.i. ha^{-1} + one hand weeding 30 days after planting was found beneficial for seed yield of onion.

Conclusion :

The plant population at 30 days after planting and at harvest was not influenced by different herbicide treatment. The number of days required for 50 per cent flowering was less in weed free check and herbicides + one hand weeding at 30 DAP than that of herbicides alone and weedy check.

The plant height was not influenced by herbicides upto 60 DAP but at later stage, it was significantly more in weed free treatment followed by oxyfluorfen @ 0.25 kg a.i. ha^{-1} among the herbicidal treatments. Within the treatments of herbicides coupled with hand weeding more height was observed in oxyfluorfen @ 0.1875 kg a.i. ha^{-1} followed by oxadiargyl @ 0.0675 kg a.i. ha^{-1}. The dry matter accumulation per plant was observed to be significantly more in weed free check followed by oxyfluorfen @ 0.1875 kg ha^{-1} coupled with one hand weeding. The accumulation of dry matter was less in unweeded control.

The seed weight per umbel, test weight and seed yield were found to be significantly higher in weed free check followed by oxyfluorfen @ 0.1875 kg ha^{-1} + one hand weeding. Among the herbicide treatments oxyfluorfen @ 0.25 kg ha^{-1} recorded higher seed weight per umbel, test weight and seed yield followed by oxadiargyl @ 0.09 kg ha^{-1}.

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