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Efficacy of Weed Control Practices in Celery Crop Production

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Abstract

Field experiment was conducted during *rabi* season of 2008-09 to find out effective weed management technology in transplanted celery on loamy sand soil. All the herbicdes and hand weeding treatments significantly reduced total weed population and their dry weight compared to unweeded/control. The lowest dose of oxyfluorfen with one hand weeding was most effective in reducing the population and dry weight of weeds and gave maximum weed control efficiency (91.9%). The integration of oxyfluorfen 0.15 kg/ha with one hand weeding at 40 days after transplanting produced maximum plant height and maximum number of branches and umbels per plant. The maximum seed yield of celery (13.0 q/ha) was obtained with oxyfluorfen 0.15 kg/ha followed by one hand weeding. The seed yield of oxyfluorfen 0.15 kg/ha integrated with one hand weeding was statistically similar to pendimethalin 1.0 kg/ha, pendimethalin 0.5 kg/ha supplemented with one hand weeding, oxyfluorfen 0.20 kg ha two hand weedings treatments. Integration of one hand weeding (40 days after transplanting) with lowest dose of each herbicide i.e pendimethalin 0.5 kg/ha, trifluralin 0.75 kg/ha and oxyfluorfen 0.15 kg/ha proved very effective.
Key words : Herbicides, Band weeding, Weed control.

Though wheat is an important *rabi* crop of Punjab state but the cultivation of rice-wheat rotation has created many serious problems lowering of water table, insect pests, diseases, weeds. Under such situations for sustainable production of wheat one has to go in for higher inputs, but steep rise in farm inputs like fertilizers, insecticides, herbicides and human labor has forced the farmers to think of shifting some area to other more remunerative crops so as to increase their return per unit area per unit time. Under these circumstances celery offers a good scope for diversification of rice-wheat system. Celery (*Apium graveolens* Linn.) commonly known as *karnauli* or *khurasani ajwain* or *ajmod* belongs to the family Apiaceae. It is commonly cultivated for seed in India and it is grown in Punjab, Uttar Pradesh and Haryana. It is cultivated by the progressive farmers at scattered places in Jalandhar, Kapurthala, Amritsar, Ludhiana and Gurdaspur districts of Punjab. Celery is a good substitute for late sown wheat after potato or toria and a good cach crop that fetches high prices in the export market. Celery can be grown successfully during the *rabi* season in Punjab. Out of various factors which influence the yield, quality net returns of celery crop, weed competition is the most serious. Proper weed management is crucial in harnessing the full yield potential of the crop. A number of weeds comes up in celery crop, which compete for moisture, nutrients, light and space and result in its yield reduction. Moreover, weed seeds also get mixed with crop produce which deteriorate quality of the product. Competition of weeds in early crop growth stages can result in a 30 to 40% reduction of celery seed yield (1). At present farmers control weeds with mechanical methods like hand weeding or interculture, which is time consuming, laborious and costly. Sometime under unfavorable climatic conditions, it is difficult to get proper control of weeds by mechanical methods. Under such situations herbicide use may prove economical, efficient and effective method of weed control in this crop. Sole dependence on mechanical weeding (hoeing) and on chemicals (herbicides) has their own limitations. So, integration of both the methods proved to be ecofriendly and most effective technique of weed management. Moreover, integrated weed management approach will lead to

judicious use of herbicides and will delay or avoid the development of resistance in weeds to herbicides.

Methods

A field experiment was conducted at Research Farm, Department of Agronomy, Punjab Agricultural University, Ludhiana during *rabi* season of 2008-09 to develop some integrated approach for the control of weeds in transplanted celery. Pendimethalin 30 EC (stomp) was applied 0.5 kg (integrated with one hand weeding 40 days after transplanting), 0.75 kg 1.0 kg/ha and trifluralin 48 EC (treflan) 0.75 kg (integrated with one hand weeding 40 days after transplanting), 1.0 kg and 1.25 kg/ha and oxyflourfen 23.5 EC (goal) 0.15 kg (integrated with one hand weeding 40 days after transplanting), 0.17 kg and 0.20 kg/ha were applied after transplanting. These treatments were compared with two hand weedings (20 and 40 days after transplanting) and unweeded (control). The soil of the experimental site was loamy sand in texture with neutral reaction (pH 7.4) having medium organic carbon (0.4%), medium available phosphorus (17.8 kg/ha) and medium available potash (248 kg/ha). The experiment was laid out in randomized block design with 14 treatments replicated four times. The nursery was sown on October 1, 2008 and transplanting was done on 22 December 2008 by using the seedlings of uniform size. The seedlings were transplanted at 45 cm inter-row and 25 cm intra-row spacing. Spray of different herbicidal treatments was done after transplanting with knap-sack sprayer with discharge rate of 500 l/ha. Weed population weed dry matter was recorded by using quadrate measuring 50 × 50 cm randomly from two locations. Weed control efficiency (WCE) was calculated by using formula given below :

$$\text{WCE (\%)} = \frac{\text{Weed dry wt in control} - \text{Weed dry wt in treatment}}{\text{Weed dry wt in control}} \times 100$$

Weed flora observed in the field included both grassy and broad leaved weeds. Major weed flora in descending order of infestation included *Oenothera drumondii, Phalaris minor, Cyperus rotundus, Medicago denticulata, Lepidium sativa, Chenopodium album, Rumex dentatus* and *Anagallis arvensis.* Among weeds, *Oenothera drumondii* was the most persistent which germinated in many flushes up to end of March.

Results and Discussion

Effect on Weeds

The weed population was influenced significantly by variable weed control treatments when recorded at harvest. All the weed control treatments except lower dose of pendimethalin significantly reduced weed population than unweeded control (Table 1). Minimum weed population was recorded with integration of oxyfluorfen 0.15 kg/ha with one hand weeding at 40 days after transplanting (4.02/m^2) which was statistically at par with its higher doses 0.17 kg/ha (4.82/m^2) and 0.20 kg/ha (4.63/m^2), pendimethalin 1.0 kg/ha (4.79/m^2), pendimethalin 0.5 kg/ha supplemented with one hand weeding at 40 days after transplanting (4.79/m^2) and trifluralin 0.75 kg/ha followed by one hand weeding at 40 days after transplanting (4.96/m^2), respectively. Higher weed population recorded under different treatments might be attributed to poor control of *Oenothera drumondii* which flourished in the absence of other weeds. Weed population decreased with the advancement of crop and it might be due to smoothering effect of celery which suppresses the growth of weeds at later crop growth stages.

All the weed control treatments reduced weed dry matter significantly as compared to unweeded control. Minimum dry matter of weeds was recorded with oxyfluorfen 0.15 kg/ha integrated with one hand weeding at 40 days after transplanting (2.77 q/ha) treatment which was statistically at par with oxyfluorfen 0.20 kg/ha (4.21 q/ha) and integration of pendimethalin 0.5 kg/ha with one hand weeding at 40 days after transplanting (2.95 q/ha)but was significantly better than all other weed control treatments (Table 1). The lower dry matter of weeds in oxyfluorfen treatments and integration of pendimethalin 0.5 kg/ha with one hand weeding at 40 days after transplanting was due to decreased weed population which may be result of its prolonged residual effect and better efficacy of chemicals as compared to other herbicides. Integrated treatments provided most effective control of weeds with both chemical and mechanical method. Similar results were also reported earlier by Thakral et al. (2) in fennel, Thakral et al (3) in coriander.

Table 1. Effect of different weed control treatments on population and dry matter of weeds (at harvest) in celery. Data subjected to $\sqrt{X + 1}$ transformation. Figures in parentheses are means of original values.

Treatments (kg/ha)	Weed population (No./m^2)	Weed dry matter (q/ha)	WCE (%)
Pendimethalin 0.5	6.14 (37.2)	19.8	42.6
Pendimethalin 0.75	5.29 (27.3)	20.4	40.8
Pendimethalin 1.0	4.79 (22.2)	11.2	67.5
Pendimethalin 0.5 + HW	4.78 (22.3)	2.95	91.4
Trifluralin 0.75	5.58 (31.5)	10.9	68.5
Trifluralin 1.0	5.26 (26.8)	19.3	43.9
Trifluralin 1.25	5.14 (26.0)	16.6	51.9
Trifluralin 0.75 + HW	4.96 (23.6)	16.9	50.8
Oxyfluorfen 0.15	5.52 (30.4)	16.2	53.1
Oxyfluorfen 0.17	4.82 (22.5)	16.4	52.4
Oxyfluorfen 0.20	4.63 (20.5)	4.21	87.8
Oxyfluorfen 0.15 + HW	4.02 (16.0)	2.77	91.9
Hand weeding	4.99 (24.0)	15.3	55.6
Control	6.73 (44.8)	34.4	-
CD (P = 0.05)	0.95	5.50	-

Integration of hand weeding with oxyfluorfen 0.15 kg/ha and pendimethalin 0.5 kg/ha recorded highest weed control efficiency of 91.9 and 91.4% respectively as compared to alone application of these herbicides (Table 1). The lower weed control efficiency in these treatments might be due to less weed dry matter accumulation by weeds as compared to other treatments.

Effect on Crop

The plants attained maximum plant height (135 cm) at harvest with oxyfluorfen 0.15 kg/ha integrated with one hand weeding at 40 days after transplanting treatment and it was significantly better than all other treatments (Table 2). The plant height under control (116 cm) was minimum and it was significantly lower than all other herbicidal treatments and hand weeding. Maximum plant dry matter was recorded under oxyfluorfen 0.15 kg/ha integrated with one hand weeding at 40 days after transplanting (80.9 g/plant) treatment which was statistically at par with pendimethalin 0.5 kg/ha supplemented with one hand weeding at 40 days after transplanting (58.7 g/plant), oxyflourfen 0.15 kg/ha (65.4 g/plant), oxyflourfen 0.17 kg/ha (27.9 g/plant) and oxyfluorfen 0.20 kg/ha (53.2 g/plant) and significantly more than all other treatments (Table 2).

Table 2. Effect of different weed control treatments on yield and yield attributing characters of celery.

Treatments (kg/ha)	Plant height (cm)	Dry matter of a plant (g/plant)	No. of branches/ plant	No. of umbels/ plant	Seed yield (q/ha)
Pendimethalin 0.5*	128	50.9	45.2	74.0	6.79
Pendimethalin 0.75	128	48.5	43.5	73.2	7.02
Pendimethalin 1.0	127	31.1	41.4	73.1	9.99
Penmdimethalin 0.5 + HW	129	58.7	46.2	74.9	11.2
Trifluralin 0.75	123	38.3	41.0	67.0	7.35
Trifluralin 1.0	126	16.2	41.3	69.8	7.64
Trifluralin 1.25	123	23.1	36.3	64.8	7.71
Trifluralin 0.75 + HW	127	48.2	43.8	71.7	8.14
Oxyfluorfen 0.15	132	65.4	46.6	76.6	8.64
Oxyfluorfen 0.17	127	57.9	42.7	73.3	7.85
Oxyfluorfen 0.20	125	53.2	42.1	67.7	9.56
Oxyfluorfen 0.15 + HW	135	80.9	47.2	78.8	13.0
Hand weeding	121	8.89	40.2	64.7	9.91
Control	116	7.85	35.2	61.5	3.61
CD (P = 0.05)	2.46	27.9	2.34	9.87	3.85

Under control minimum plant dry matter (7.85 g/plant) was recorded which was statistically at par with pendimethalin 1.0 kg/ha (31.1 g/plant), trifluralin 1.0 kg/ha (16.2 g/plant), trifluralin 1.25 kg/ha (23.1 g/plant) and hand weeding (8.89 g/plant) and significantly lower than all other herbicidal treatments.

The maximum number of branches per plant were observed under oxyfluorfen 0.15 kg/ha integrated with one hand weeding at 40 days after transplanting (47.2) treatment which was signficantly higher than all other treatments but was statistically at par with oxyfluorfen 0.15 kg/ha (46.6), pendimethalin 0.5 kg/ha integrated with one hand weeding at 40 days after transplanting (46.2) and pendimethalin 0.5 kg/ha (45.2) treatments (Table 2). The minimum number of branches per plant were recorded under control (35.2) it was significantly lesser than all other herbicidal treatments except trifluralin 1.25 kg /ha (36.3) treatment. The number of umbels per plant was maximum under oxyfluorfen 0.15 kg/ha integrated with one hand weeding at 40 days after transplanting (78.8) treatment which was significantly higher than trifluralin 0.75 kg/ha (67.0), trifluralin 1.25 kg/ha (64.8), oxyfluorfen 0.20 kg/ha (67.7), hand weeding (64.7) and control (61.5), respectively but statistically at par with other herbicidal treatments.

However, minimum number of umbels per plant are recorded under control (61.5).

The effect of different weed control treatments on seed yield of celery was significant. The unweeded or control treatment produced seed yield of 6.31 q/ha and it was significantly less than all other weed control treatments (Table 2). The integrated treatment of oxyfluorfen 0.15 kg/ha produced maximum seed yield of 13.0 q/ha which was statistically at par with pendimethalin 1.0 kg/ha, pendimethalin 0.5 kg/ha supplemented with one hand weeding at 40 days after transplanting, oxyfuorfen 0.20 kg/ha and hand weeding treatments but was significantly more than all other weed control treatments. The seed yield of pendimethalin 0.5 kg/ha followed by one hand weeding at 40 days after transplanting was significantly more than pendimethalin 0.5 kg/ha and pendimethalin 0.75 kg/ha treatment. The effect of different doses of trifluralin alone or in combination with hand weeding did not influence the seed yield of celery significantly. The lower doses of oxyfluorfen 0.15 and 0.17 kg/ha production significantly less seed yield than oxyfluorfen 0.15 kg/ha followed by one hand weeding at 40 days after transplanting. The higher seed yield under these treatments might be due to the effective control of weeds which reduced weed competition and dry matter of weeds and created favorable conditions for growth and development of celery which produced taller plants with higher number of branches per plant and more number of umbels per plant under these treatments which ultimately increased the seed yield. The results are in line with the observations of Sagarka et al. (4).

References

1. Reddy T. Y. and G. H. S. Reddi. 2005. *Principles of agronomy.* Kalyani Publ., New Delhi, India.
2. Thakral K. K., P. S. Partap and V. K. Batra. 1995. Efficacy of chemical and cultural weed control in fennel. *Haryana J. Hort. Sci*. 24 : 265—269.
3. Thakral K. K., S. C. Khurana and V. K. Srivastava. 1991. Evaluation of herbicides in coriander seed crop. *Proc, 1st Nat. Sem. on Seed Spices.* Spices Bd, Min. Comm., GOI, Kochi, India. 119 pp.
4. Sagarka B. K., B. B. Ramani, R. K. Mathukia and V. D. Khanpara. 2005. Integrated weed management in coriander. *Ind. J. Weed Sci.* 37 : 231—233.