



EFFECT OF HERBICIDES APPLICATION ON GROWTH AND YIELD OF MENTHA CROP

Agricultural Science

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ABSTRACT

Mentha a commercially significant crop is known for its essential oil content used in industries for making different products. Multiple species of mentha are cultivated in India under different agroclimatic zones. In Punjab also, it is grown in many districts. As it is a slow growing crop so weeds can hamper the growth of this crop at initial stages. A lot of herbicides are being in use for controlling weeds in the crop and also manual weeding is done. By keeping in view, the advantages and disadvantages of various weed control measures, an experiment was conducted in LPU, Phagwara for three species and five methods of weed control. The results showed that *M. arvensis* was superior in terms of herbage and oil yield along with maximum benefit cost ratio when hand weeding was adopted.

KEYWORDS

Agil, Basagran, Mentha, weeds

Introduction

Mentha is cultivated commercially for getting essential oil having major constituent as menthol, which is about 70% in Japanese mint and around 50% in peppermint oil used in various industries like perfumeries, cosmetics, medicines, lotions soaps etc. India leads in production and selling of mint oil in the world. It is cultivated mainly in the semi temperate regions like Uttar Pradesh, Punjab, Haryana, H.P, Bihar and Assam. About 3,00,000 hectares area covered by Mentha crop in India (Anonymous, 2019). Mentha in Punjab state grown in Jalandhar, Ludhiana, Kapurthala, Hoshiarpur, Patiala, Ropar, Amritsar and Faridkot districts in about 15,000 hectares area (Anonymous, 2012). India is now producing more than 18000 tonnes of mentha oil as compared to global generation of 22, 000 tonnes every year and emerges as leader seller of Mentha oil (Anwar *et al.*, 2010).

Mentha is a slow growing crop at initial stage but weeds can grow faster than crop so compete for space, water, sunlight and nutrients. Weeds reduce the photosynthetic efficiency of crop and dry matter production. Weeds are mainly managed by using manual method that is expensive, tough and also time consuming practice. Additionally, there is a problem of labour availability. Uses of herbicides in this case become an awesome option for solving the problem of weeds and increasing the growth and yield of mentha crop.

Material and Methods

An experiment was conducted at Agricultural Research Farm, LPU, Phagwara. The experimental area was located at 31.3°N and 75.5°E at an altitude of 228m above m.s.l. The experiment was laid down in randomized complete block design with 15 treatments and 3 replications. The treatments were T1- Control; T2- Hand weeding; T3- Agil- propaquizafop 10% EC; T4- Basagran-bentazone 480 G/L SL; Sulfosulfuron 75% WG for three species viz. *Mentha piperita*, *Mentha arvensis*, *Mentha spicata* were planted in the first week of March, 2019 by using healthy suckers @5 q/ha. Recommended fertilizers were applied and crop was irrigated frequently as per requirement of water. Harvesting of the crop was done in the first fortnight of July, 2019.

Results and Discussion

As presented in table 1 it is evident that highest height of plant i.e. 68.8 cm was in *Mentha spicata* followed by other two species at 120 DAS. Both *M. piperita* and *M. arvensis* were also at par in terms of plant height. However among weed control methods, highest plant height (67.9 cm) was there in the treatments where hand weeding was done, though it was at par with Agil and Basagran treated plots. Control plot has recorded almost similar plant height as in herbicides treated plots except Sulfosulfuron treated that has least effect on plant height of menthe species. And it is also noticeable that a significant interaction is present between species and weed control methods on plant height.

No significant difference was found in terms of dry matter for species, while Agil treated plots and hand weeding treatments were remained at par. When leaf to stem ration was compared, it has been observed that *M. arvensis* took a lead with highest value of 1.33 and *M. spicata*

having the least leaf stem ratio. There was no significant difference observed in leaf stem ratio among different weed control methods.

Fresh herbage yield in mentha was found highest (151.7 q ha⁻¹) in *M. arvensis* out of three species followed by other two, which are statistically at par with each other. However, herbage yield was not significantly affected by the weed control methods and interaction of species with weed control measures also.

Essential oil and oil yield were observed superior in case of *M. arvensis* to the tune of 0.63% and 96 kg per hectare. Other two species showed similar trend in essential oil and oil yield with statistically similar values and lesser than *M. arvensis* (Table 2). Although refractive index has no difference but specific gravity was more in case of *M. spicata*. Significantly highest essential oil content was recorded for hand weeding treatment followed by control, Agil and basagran treated plots. Statistically similar oil content quantity was noticed in hand weeding treatment and plots treated with Agil and Basagran. Control plot has given least amount of oil yield.

As evident from weed control efficiency values (Table 3), it can be concluded that weeds were controlled most effectively by hand weeding method compared to herbicides application. However manual weeding is costly and time consuming process, its benefit cost ratio remained lesser than Agil and Basagran treated plots. Lowest value of benefit cost ratio was for control plot. Sulfosulfuron treated plots showed almost no beneficial effect in terms of herbage yield, essential oil content, oil yield and benefit cost ratio.

Non- significant difference was observed between *M. arvensis* and *M. spicata* in terms of weed control efficiency, while statistically similar benefit cost ratio was there in *M. arvensis* and *M. piperita*.

From this discussion, it can be concluded that *Mentha arvensis* species cultivated with hand weeding method of weed control showed superiority in terms of herbage yield, oil content, essential oil percentage and benefit cost ratio as compared to other species and weed control methods.

Table 1. Growth and yield attributes of mentha species under different weed control measures

Treatments	Plant height (cm) at 120 DAS	Dry matter (kg m ⁻²)	Leaf stem ratio at harvest stage	Fresh herbage yield (q ha ⁻¹)
Species (S)				
<i>Mentha piperita</i>	58.3	0.40	1.07	129.3
<i>Mentha arvensis</i>	55.9	0.45	1.33	151.7
<i>Mentha spicata</i>	68.8	0.38	0.54	121.7
CD	4.6	NS	0.05	21.1
Weed control methods (M)				
Control	59.5	0.34	0.96	107.9

Handweeding	67.9	0.46	1.00	153.2
Agil	64.2	0.46	0.99	154.1
Basagran	65.0	0.43	1.00	145.7
Sulfosulforon	48.2	0.36	0.95	110.3
CD	5.9	0.08	NS	NS
Interaction (SXM)	10.2	NS	NS	NS

Table 2. Essential oil content in Mentha and its yield under various treatments

Treatments	Essential oil content in (% v/w)	Oil yield in kg per ha	Refractive index	Specific gravity
Species (S)				
<i>Mentha piperita</i>	0.35	45.8	1.456	0.902
<i>Mentha arvensis</i>	0.63	96.0	1.456	0.898
<i>Mentha spicata</i>	0.34	41.3	1.474	0.912
CD	0.01	9.7	NS	0.001
Weed control methods (M)				
Control	0.44	48.0	1.462	0.903
Handweeding	0.45	70.4	1.463	0.905
Agil	0.44	69.1	1.463	0.904
Basagran	0.44	66.0	1.462	0.904
Sulfosulforon	0.43	51.7	1.461	0.903
CD	0.01	12.5	NS	0.001
Interaction (SXM)	0.01	NS	NS	NS

Table 3. Weed control efficiency in mentha under different treatments

Treatments	Weed control efficiency (%)	Benefit Cost Ratio
Species (S)		
<i>Mentha piperita</i>	37.2	1.68
<i>Mentha arvensis</i>	42.1	1.77
<i>Mentha spicata</i>	43.5	1.26
CD	1.88	0.24
Weed control methods (M)		
Control	0.00	1.30
Handweeding	62.6	1.66
Agil	57.8	1.81
Basagran	50.9	1.77
Sulfosulforon	33.4	1.31
CD	2.43	0.31
Interaction (SXM)	4.21	NS

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