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WEED CONTROL MEHTODS INFLUENCE THE GROWTH ATTRIBUTES OF WEEDS AND RADISH (*Raphanus sativus* L.) UNDER SEMIARID CONDITION

Syed Tanveer Shah[1], Nadeem Khan[1], Muhammad Sajid[1], Noor ul Amin[1], Abdur Rauf[4], Shahida Bibi[2,*], Bibi Haleema[5] and Faheem ul Haq[3]

ABSTRACT

Weed competition can reduce the growth and yield by affecting the size and quality of radish crop. Therefore, the present study was conducted at Ornamental Horticulture Nursery, The University of Agriculture Peshawar during 2014 to study the effect of different weed control practices on growth and yield of radish. The experiment was laid out in a Randomized Complete Block (RCB) Design, keeping three replications. Different weed control methods i.e. hand weeding, black plastic, canola straw and weedy check were applied for weed management in radish (cv. long white). The results showed that all the treatments significantly affected weed density m^{-2}, fresh and dry weed biomass, and yield components of radish such as root length (cm) and root weight (g) $plant^{-1}$. Hand weeding resulted in the highest root length (27.67 cm) and root weight $plant^{-1}$ (161.60 g), whereas significantly reduced the weed density (104 weeds m^{-2}), fresh weed biomass (201.66 g m^{-2}) and dry weed biomass (60.5 g m^{-2}). Therefore, it is concluded from the results that hand weeding is the only most efficient treatment in terms of weed control and growth enhancement of radish crop.

Key words: Growth, hand weeding, mulching, radish, weeds.

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[1]Dept. of Horticulture, [2]Dept. of Weed Science, [3]Dept. of Horticulture, AMK Campus (Mardan), The University of Agriculture Peshawar, Pakistan.
[4]Soil and Plant Nutrition Section, Agriculture Research Institute, Tarnab, Peshawar, Pakistan
[5]Plant Physiology, Agriculture Research Institute, Tarnab, Pakistan
*Corresponding author's email: shahida@aup.edu.pk

INTRODUCTION

Radish (*Raphanus sativus* L.) is an ancient as well as popular vegetable of temperate regions of the world. Radish is widely consumed as a root vegetable and its tender leaves are used as a green vegetable. It is a rich source of carbohydrates, protein and vitamins A & C. In Pakistan, radish is grown on an area of 10.133 thousand hectares with a total production of 173.806 thousand tones (MNFS&R, 2013). The average yield of radish in Pakistan is 15.91 tons ha^{-1} that is far behind the yield obtained in other countries of the world (Wall and Friesen, 1990).

The main cause of low yield is lack of better production technologies. Though, it has quick initial growth, still it suffers due to weed infestation that lead to 2-41% reduction in yield (Leela, 1987). If crops are kept weed free at the early stage of development, growth and yield will not be affected significantly. Later on, the radish plants will be well recognized and out compete the weeds. Although early weeding is critical to produce good growth and yield, however the late control is also significant in preventing the weeds from flowering and producing seeds, which would affect the crop and increases weed shipment in following seasons. Harvesting will also be made easier if the crop is weeds free (Zahid *et al*., 2011). Weed competition can reduce yield by affecting tuber size, weight, and quantity (Wall and Friesen, 1990).

The environmental and human health concern, worldwide efforts are being made to reduce the heavy reliance on artificial herbicides that are used to the control weeds. Effective weed control techniques are necessary to the crops, which are safe for the environment and consumers (Singh *et al*. 2003; Armengot *et al*. 2013). Keeping in view losses due to weeds in radish crop, this immediate study was designed weeds control in radish using organic and inorganic mulches.

MATERIALS AND METHODS

To study the effect of different weed control practices on growth and yield of radish, an experiment was conducted at The Ornamental Horticulture Nursery, Department of Horticulture, The University of Agriculture Peshawar during 2014. The experiment comprised of four treatments such as canola straw as organic mulch, whereas black plastic as an inorganic mulch, in addition to a hand weeding and a weedy check. The experiment was laid out in a Randomized Complete Block Design (RCBD) having three replications. Radish variety "Long white" were sown in the month of September with row to row and plant to plant distance of 30 and 10 cm, respectively. For fertilizers, the urea was used as a source of nitrogen

and SSP was used as phosphorus source. Nitrogen was applied in two splits (half at sowing time and half after 30 days of sowing) at the rate of 120 kg ha^{-1}. Black plastics were kept between rows, soon after the sowing process and small stones were kept on the surface of the black plastic. In another treatment, soil surface between radish rows was covered by canola straw as a mulching technique. The data was recorded on weeds density m^{-2}, fresh and dry weeds biomass (g m^{-2}), and raddish root length (cm) and root weight (g). Weeds density was recorded at 30 days after sowing from randomly selected two central rows from each experimental plot and was averaged to get weeds density m^{-2}. Fresh and even dry weeds biomass (g m^{-2}) and weed flora of the samples were also recorded. Data recording to the radish root length (cm) and root weight (g) $plant^{-1}$ was taken by measuring the roots picked from five randomly selected plants and their averages were calculated.

Statistical analysis

The data recorded on different parameters were analyzed by using the statistical computer software Statistix 8.1 (Statistix ® 8 Analytical Software, 2003).

RESULTS AND DISCUSSION

Weed density (m^{-2})

Data pertaining to the weeds density m^{-2} in plots of radish crop significantly ($P \leq 0.05$) affected by hand weeding (Table-1). Higher weeds density was observed in weedy check plots (175 m^{-2}), whereas hand weeding treatments resulted in lower weed population (104 m^{-2}). The higher weeds density in weedy check plots may be credited to the open soil surface and niches available to weeds for free and fast growth. Timely weeding in hand weeded plots might be the possible reason for lower weeds population in these plots. These results are also in accordance with those of Fathi *et al*. (2003), Hassan *et al*. (1995) and Ali *et al.* (2016). Hassan and Ahmad (2005) found highest number of weeds m^{-2} in weedy check plots and lowest in hand weeded treatments.

Fresh and dry weed biomass (g m^{-2})

Weeds fresh and dry biomass in radish crop was significantly ($P \leq 0.05$) reduced by hand weeding as presented in Table-1. Highest fresh weed biomass (295 g m^{-2}) and dry weed biomass (88.5 g m^{-2}) were recorded in weedy check plot, whereas lowest weed fresh biomass (201.66 g m^{-2}) and dry weed biomass (60.5 g m^{-2}) was recorded in hand weeded treatments. Timely removal of weeds in hand weeding plots could be the possible reason for lower weeds fresh biomass in theses plots. Weeds were profitably controlled in hand weeding and black plastic mulched plots. Generally an increase in

weed growth corresponds to a decrease in crop growth (Rao, 2000; Kulsoom and Khan, 2015), as the resources of land, water and nutrients are equally shared by weed and crop plants in which weeds are more competent. The weeds in the hand weeding plots were destroyed through weeding twice; in black plastic mulch weeds seeds might have failed to germinate due to lake of light and rise in temperature under black plastic (Syawal, 1998). Khan *et al*. (1998) reported that hand weeding is the most efficient weed control method. Unger and Ackermann (1992) reported that cover crops (live mulches) reduced weed biomass from 41 to 94%. Moreover, Gul *et al*. (2011) revealed that weed fresh biomass was significantly lower in hand weeding plots due to the eradication of weed density at early stage of the crop.

Root length (cm) plant^{-1}

Data pertaining to the root length (cm) are presented in Table-2. Mean data table for root length showed that different weeds control methods caused significant ($P \leq 0.05$) difference in root length of radish crop. Maximum root length (27.67 cm) was recorded from hand weeded plots, whereas minimum (21.67 cm) was recorded from weedy check plots. It might be due to effective control of weeds with hand weeding that created favorable environment for the crop and root growth. Less competition for available resources like nutrients, light and space might be possible reason for increasing root length in the respective plots (Rao, 2000).

Root weight (g) plant^{-1}

Data recording to the root weight (g) plant^{-1} were significantly ($P \leq 0.05$) affected by weed control methods in radish crop as shown in Table-2. Mean data showed that maximum root weight plant^{-1} (236.93 g) was recorded in hand weeding plots and minimum root weight plant^{-1} (140.97 g) was recorded from plots weedy check. It has become obvious from the study of Rao (2000) that weed growth and crop growth are inversely relative to each other i.e. reduce the weeds number increase the crop performance. Our results are similar with the findings of Chalfant *et al*. (1977) who reported that without weeds the crop root weight increase due to favorable soil and nutrients availability.

Weed Flora

Different weeds were found in the field during the course of the experiment including *Anagallis arvensis* L*., Phalaris minor Retz., Coronopus didymus* L*.* Sm., *Oenothera drumendii* Hook., *Chenopodium album* L*.* and *Medicago denticulata* Willd.

CONCLUSION

Hand weeding resulted in the highest radish root length and root weight plant^{-1}, while significantly reduced the weed density, fresh weed biomass and dry weed biomass. Therefore, it is recommended from the present conclusion that hand weeding resulted as the most efficient treatment in terms of weeds control and growth enhancement of radish crop.

Table-1. Weeds density m^{-2}, fresh and dry weeds biomass (g m^{-2}) as affected by different weed control treatments.

Treatments	Weeds density m^{-2}	Fresh weeds biomass (g m^{-2})	Dry weeds biomass (g m^{-2})
Weed check	175 a	295 a	88.5 a
Canola straw	146 b	247.33 b	73.3 b
Black Plastic	142 b	221 c	66.3 c
Hand weeding	104 c	201.66 d	60.5 d
$LSD_{(0.05)}$	10.52	12.6	3.37

Means followed by similar letters are statistically non-significant at 5 % level of significance

Table-2. Length (cm) and weight (g) of root plant^{-1} of radish as affected by different weed control treatments.

Treatments	Root length plant^{-1}(cm)	Root weight plant^{-1} (g)
Weed check	21.66 c	140.97 c
Canola straw	24.33 b	181.10 b
Black Plastic	25.33 b	195.33 b
Hand weeding	27.66 a	236.93 a
$LSD_{(0.05)}$	1.76	14.9

Means followed by similar letters are statistically non-significant at 5 % level of significance

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