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INFLUENCE OF MULCHING ON GROWTH AND YIELD ATTRIBUTES OF RADISH (*RAPHANUS SATIVUS* L.)

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ABSTRACT

A field experiment was conducted at crop research centre-1 of ITM University, Sithouli campus, Gwalior during 2023 and the observations were taken at various growth and yield attributing parameters to study the “Influence of Mulching on growth and yield of Radish Crop”. The experiment consisted seven different mulching treatments. The total 7 treatments (T₁- control, T₂–Mulching with paddy straw, T₃–Mulching with neem leaves, T₄– Mulching with sorghum straw, T₅–Mulching with FYM, T₆–Black polythene mulch and T₇– White polythene mulch) were laid out in randomized block design with three replications. The experimental results revealed that in growth parameters the Black mulch recorded significantly higher plant height at 30 days and 45 days, number of leaves per plant at 45 days, length of leaves at 30 days and 45 days. Further in yield parameters results revealed that again the black polythene mulch recorded significantly higher length and diameter of the roots, fresh weight of the roots, average weight of root per plant, total root yield per plot over rest of other treatments. Finally, the quality parameter results revealed that Black mulch recorded significantly higher Total soluble solids over rest of other treatments. The white polythene mulch showed the highest number of leaves at 30 days over the rest of other parameters. And the paddy straw treatment showed the highest dry weight of the root over rest of other treatments. However, black polythene mulch registered statistically at par with white polythene mulch.

Keywords: Radish, experiment, growth, yield, mulch

Introduction

Radish (*Raphanus sativus* L.) is a tuberous vegetable crop, belonging to the family Brassicaceae. It is a popular root vegetable in both tropical and temperate regions in the world. For early production, it can be grown under cover, but in India, large-scale field cultivation is more typical. Radish has several benefits for human health as it contains antioxidants and other compounds, which help to prevent cancer (Coogan *et al.*, 2001). Radish is grown for its young tender tuberous root which is consumed either cooked or raw. It is a good source of vitamin-c and minerals like calcium, potassium and phosphorus. It has refreshing and diuretic properties. The increased crop yield in semi-arid regions can be attained by fertilization; however, increasing fertilization may not be sufficient to maintain higher yields in the long term (Huang *et al.*, 2003). The most important environmental factors are temperature and rainfall, which affect the growth and development of plants. To attain better control and management of water in crop production, irrigation should counterpart to crop requirements (Maggio *et al.*, 2002). The main pathways for increasing water use efficiency in irrigated agriculture are to increase the output per unit of water (engineering and agronomic management aspects), reduce losses of water to impracticable sinks and decrease water degradation (ecological aspects), and transfer water to higher priority uses (sociological aspects) (Howell, 2006).

Consequently, there is a great probability of increasing crop yield, if the water is available (Huang *et al.*, 2005). The limiting factors for undertaking agriculture in many arid and semi-arid regions of the world considered are the quality and quantity of irrigation water (Munns, 2002).

A natural or artificially spread layer of plant residues or other material on the surface of the soil is called mulch. Mulching is important in agriculture as it conserves moisture, controls temperature, prevents surface compaction, reduction of runoff and erosion, improvement in soil structure and weed control (Ranjan *et al.*, 2017). A mulch cover of various materials on soil conserves water and enhances soil health. Although inorganic mulching materials are popular, organic mulching possesses an exceptional value for its ability to increase the cation exchange capacity of the soil and in the retention of nutrients close to its particles (Bonini *et al.*, 2015). Therefore, this study aimed to detect the growth and yield of radish (*Raphanus sativus* L.) as influenced by the different mulch types in Madhya Pradesh region.

Materials and Methods

The field study was conducted to study the influence of mulching on the growth and yield attributes of radish (*Raphanus sativus* L.). The experiment was carried out during the year 2023 at crop research center, Sithouli campus, Gwalior, Madhya Pradesh. Arka Nishant variety of

radish was grown using the spacing of 15 x 10 cm. Appropriate standard and uniform agronomical / cultural practices and plant protection measures were adopted for raising healthy crop. The experiment was laid out by adopting Randomized Block Design (RBD) with three replications; having a net plot size of 3x4 m with row-to-row distance of 15 cm and plant to plant 10 cm. 7 treatments were taken along with control were as follows:

- T1-control
- T2-mulching with paddy straw
- T3-mulching with neem leaves
- T4-mulching with sorghum straw
- T5-mulching with FYM
- T6-mulching with black polythene
- T7-mulching with white polythene

Observations were recorded under investigation *i.e.*, the plant height, length of leaves, fresh weight of root, dry weight of root, root length, diameter of root, average weight of root, yield of root. All the above-mentioned observations were recorded from five plants were randomly selected from each treatment for determining various growth and yield parameters.

Results and Discussion

The data pertaining in Table.1 revealed that significant influence of different mulches on plant height of radish. The significantly highest plant height (23.20 cm) was recorded under treatment T₆ (Black polythene mulch) and lowest plant height (17.02 cm) recorded in T₁-control treatment. Plant height at 30 DAS (23.20 cm) in T₆ (Black polythene mulch) was found significantly higher over the rest of the treatments. Similarly, the significantly maximum plant height (35.07 cm) was recorded under treatment T₆ (Black polythene mulch) and lowest plant height (27.22 cm) recorded in T₁-control treatment at 45 DAS. The remaining treatments *viz.*, T₂(Paddy straw mulch), T₃(Neem leaves), T₄(Sorghum straw), T₅(FYM)and T₇(White polythene mulch) recorded plant height of 30.85 cm, 27.74 cm, 28.46 cm, 28.81 cm and 33.97 cm respectively at 45 DAS. These results agree with previous findings by Carmichael *et al.* (2012), who reported an increase in radish growth parameters with increasing irrigation depth. These authors also demonstrated that the use of mulching can significantly influence the growth of the radish.

The data pertaining to average number of leaves of radish plant taken at 30 and 45 days after sowing of radish has been presented in Table 4.1.2. it is evident from the

observation recorded that there was a significant effect of various treatment on number of leaves of radish plant measured at 30 and 45 days after sowing. The highest number of leaves/plant (8.70) was recorded with T₇ (White mulch) which was at par with T₆ (8.41 leaves) at 30 DAS. However, considerably lowest number of leaves per plant (6.63) recorded in T₁ (Control) treatment. Similarly, at 45 days after sowing the highest number of leaves/plant (11.16) was recorded with T₆ (Black mulch) which was at par with T₇ (10.93 leaves/plant). Whereas, minimum number of leaves per plant (8.99) was observed in T₁ (Control) treatment

The perusal of data indicated that average length of leaves at 30 DAS influenced significantly by application of different mulching treatments. The significantly highest average length of leaves (15.47 cm) was recorded under treatment T₆ (Black polythene mulch) and lowest average length of leaves (11.09 cm) recorded in treatment T₃(neem leaves mulch). Whereas, at 45 days after sowing significantly highest average length of leaves (17.70 cm) was recorded under treatment T₆ (Black polythene mulch) and lowest average length of leaves (11.73 cm) recorded in T₁-control treatment. The remaining treatment *viz.*, T₂,T₃,T₄,T₅and T₇recorded length of 16.20, 13.07, 12.92, 13.24 and 16.27 cm, respectively at 45 days after sowing. The black plastic may have created conditions which promoted plant growth through moisture availability and weed suppression resulting in high length of leaves. Conducive conditions to plant growth imparted by mulches have been reported previously (Rosenberg *et al.*, 1983).

The data showed in Table1. revealed that maximum length of root 24.12 cm observed in T₆ (Black polythene mulch) treatment and the lowest length of root 17.42 cm was observed in T₁-Control treatment respectively. The next best treatment was the T₇ (White polythene mulch) with 22.78 cm. The remaining treatments *viz.*, T₂(Paddy straw mulch), T₃(Neem leaves), T₄(Sorghum straw), T₅(FYM) recorded the root length of 20.32, 17.46, 18.29, 18.59 cm respectively.

The data presented in Table 1.showed that maximum diameter of root (42.19 mm) was recorded under treatment T₆ (Black polythene mulch) and minimum diameter of root (34.46 mm) recorded in T₁-control treatment. The next best treatment was the T₇ (White polythene mulch) with 41.00mm. The remaining treatments *viz.*, T₂(Paddy straw mulch), T₃(Neem leaves), T₄(Sorghum straw), T₅(FYM) recorded the root diameter of 37.34, 34.65, 35.59, 35.90mm respectively.

Table 1 : Influence of different mulching treatments on various growth and yield attributes of radish.

Treatment	Plant height (cm)		Number of leaves		Length of leaves (cm)		Length of root (cm)	Diameter of root (mm)	Fresh weight of root (g)	Dry weight of root (g)
	30 DAS	45 DAS	30 DAS	45 DAS	30 DAS	45 DAS				
T ₁	17.02	27.22	6.63	8.99	11.27	11.73	17.42	34.46	210.67	14.46
T ₂	20.66	30.85	8.28	10.64	13.84	16.20	20.32	37.34	236.78	20.50
T ₃	18.08	27.74	6.74	9.10	11.09	13.07	17.46	34.65	226.01	14.57
T ₄	18.85	28.46	7.40	9.76	11.88	12.92	18.29	35.59	229.05	15.61
T ₅	19.17	28.81	7.65	10.01	11.99	13.24	18.59	35.90	232.95	15.56
T ₆	23.20	35.07	8.41	11.16	15.47	17.70	24.12	42.19	252.11	20.23
T ₇	22.06	33.97	8.70	10.93	14.69	16.27	22.78	41.00	246.17	19.32
SE(m)	0.93	1.38	0.43	0.42	0.71	0.72	0.92	1.73	7.67	0.99
C.D.	2.88	4.24	1.33	1.29	2.20	2.22	2.85	5.32	23.64	3.05
C.V.	8.14	7.87	9.69	7.21	9.61	8.62	8.06	8.01	5.69	9.98

The treatment T₆ (black polythene mulch) was found at par with treatment T₇ (White polythene mulch) in terms of diameter of root. It appears that conditions with increased soil moisture content promoted growth, hence increasing root diameter. This was evident under mulched conditions.

Significantly maximum fresh weight of root (252.11 g) was recorded under treatment T₆ (Black polythene mulch) and minimum fresh weight of root (210.67 g) recorded in T₁-control treatment. Fresh weight of root (252.11 g) in T₆ (Black polythene mulch) was found significantly higher over the rest of the treatments. The next best treatment was the T₇ (White polythene mulch) with 246.17. The remaining treatments viz., T₂(Paddy straw mulch), T₃(Neem leaves), T₄(Sorghum straw), T₅(FYM) recorded the root diameter of 236.78, 226.01, 229.05, 232.95 gm respectively.

The data presented in Table 1. showed that maximum dry weight of root (20.50 g) was recorded under treatment T₂ (Mulching with paddy straw) and minimum dry weight of root (14.46 g) recorded in T₁-control treatment. Dry weight of root (20.23 g) in T₆ (Black polythene mulch) was found next better treatment among the rest of the treatments.

Perusal of data given in Table 2. indicated that maximum average weight of root per plant (219.73 g) was recorded under treatment T₆ (Black polythene mulch) and lowest average weight of root per plant (180.20 g) recorded in T₁-control treatment. It is evident from the observation recorded that there was a significant effect of various treatment on total root yield per plot. The significantly highest total root yield (16.17 kg) was recorded under treatment T₆ (Black polythene mulch) and lowest total root yield (11.24 kg) recorded in T₁-control treatment. Total root yield in T₆ (Black polythene mulch) was found significantly higher over the rest of the treatments. The treatment T₆ (Black polythene mulch) was found at par with treatment T₇ (White polythene mulch) in terms of total root yield. The remaining treatment viz., T₂, T₃, T₄ and T₅ recorded yield of 14.67, 12.33, 13.77 and 14.31kg per plot, respectively. A significant improvement in yield attributes with use of black plastic mulches may be due to conserved soil moisture, moderate plant water status, soil temperature and increased availability of plant nutrients as reported by Huang *et al.* (2008). Probable reason for increased root yield per plot due to humus substances could have mobilized the reserve food materials to the sink through increased activity of hydrolyzing and oxidizing enzymes. The result of this research has been found little bit similar with the result of Mehwish *et al.* (2016) in radish.

Table 2 : Influence of different mulching treatments on various yield attributes of radish

Treatments	Average weight of root(g)/plant	Total root yield per plot (kg/plot)
T ₁	180.20	11.24
T ₂	206.25	14.67
T ₃	184.62	12.33
T ₄	187.42	13.77
T ₅	194.58	14.31
T ₆	219.73	16.17
T ₇	215.50	15.73
SE(m)	9.02	0.83
C.D.	27.80	2.56
C.V.	7.88	10.24

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