

Original Research Article

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Influence of Different Mulch Materials on Vegetative Growth and Yield of Ginger (*Zingiber officinale* Rosc.) under Drip Irrigation System

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ABSTRACT

A field trial was conducted at the Krishi Vigyan Kendra, Raisen, Madhya Pradesh for two consecutive years during 2016-2017 & 2017-2018 to determine the influence of different mulch materials on vegetative growth and yield of ginger (*Zingiber officinale* Rosc.) under drip irrigation system. The research trials for the consecutive two years showed that plastic mulch resulted significantly higher in plant height, No. of tillers clump⁻¹, Number of leaves clump⁻¹, No. of primary rhizomes, Length of primary rhizome (cm), Diameter of primary rhizome (cm), Number of secondary rhizome, Length of secondary rhizome (cm), Diameter of secondary rhizome (cm), Rhizome yield plant⁻¹ (g) and Rhizome yield (t) ha⁻¹, whereas days to maturity were lower in the treatment of control. The highest yield plant⁻¹ and ha⁻¹ was observed under the treatment of plastic mulch (434.13 gm plant⁻¹ and 34.730 t ha⁻¹) with 124.20% increase in yield as compared to control without mulch (193.80 gm plant⁻¹ and 15.49 t ha⁻¹). Followed by yield plant⁻¹ and yield ha⁻¹ were observed under the treatment of *Butea monosperma* and Paddy straw almost at par for both treatment (293.53 gm plant⁻¹, 23.480 t ha⁻¹ and 272.617 gm plant⁻¹, 21.807 t ha⁻¹, respectively).

Keywords

Ginger, Drip irrigation, Mulching, Yield

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Introduction

Ginger is a high value cash crop and requires lot of management practices for increasing its production and productivity. Mulching the fields with green manure is the most important operations carried out for successful ginger production. In the dry months, it conserves the moisture in the soil and enhances soil temperature for proper germination of the rhizome. In addition, it checks weed growth and enriches the fertility of the soil after decomposition of the weeds. Further it prevents washing out of soil and nutrients during heavy rains (Randhawa, 1969 and

Mohanty, 1977). Mulching has been found to increase the yield of ginger (Aclan, 1976 and Mohanty and Sharma, 1978). Ginger being a crop with high water requirement, assured water supply throughout its growth period of 8 to 9 months is essential. Increasing scarcity of water often encountered in many parts of Madhya Pradesh regions necessitates alternative means to provide adequate water to the crop without wastage. Irrigation plays a paramount role in increasing the use of inputs and enhancing cropping intensity as well as productivity of a crop. However, water is becoming increasingly scarce worldwide due to various reasons. Drip irrigation is an irrigation

technique which saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone. Farmers look towards the Ginger crop as a cash crop with drip irrigation technique, now a day's inline drip tubes used instead of online dripper from last few years. Hence, the present study was taken up in ginger cv. Suprabha with the objective of studying the impact of different mulch materials on vegetative growth and yield of ginger under drip irrigation system.

Materials and Methods

The field experiments were conducted at Krishi Vigyan Kendra, Raisen, Madhya Pradesh during 2016-2017 & 2017-2018 on plain land having medium black soil. Four treatments were used namely T₁-silver plastic film of 50 μ thickness (200 gauge), T₂-green leaves of *Butea monosperma*, T₃ - one year old of paddy straw and T₄ - control (without mulch). The drip irrigation system was installed and operated daily to provide the sufficient moisture to the plants. The lateral lines were laid parallel to the crop rows and each lateral served two rows of crop. Emitters were fixed 0.3 m apart to serve the irrigation water requirement of plants. Standard agronomic practices such as fertilization and plant protection measures were applied during the entire crop period. The FYM 20 t ha⁻¹ was applied as basal dose and 100 kg each of N, P and K ha⁻¹ was applied in split doses through drip irrigation. The experiment was conducted in a randomized block design with three replications. Ginger rhizomes were sown at a spacing of 40 cm x 25 cm in the last week of April in both the years. Observations were recorded on plant height (cm), No. of tillers/clump, Number of leaves/clump, Days to maturity, No. of primary rhizomes, Length of primary rhizome (cm), Diameter of primary rhizome (cm), Number of secondary rhizome, Length of secondary rhizome (cm), Diameter

of secondary rhizome (cm), Rhizome yield /plant (g) and Rhizome yield/ hectare (t). The number of sprouts were counted from each treatment at 50 DAP. Growth parameters were recorded in the first week of November. The crop was harvested in the last week of December and yield per hectare was estimated.

Results and Discussion

The experimental results shows the pooled values of both year treatment-wise observations of the crop were recorded from April 2016 to December 2017. In the Table 1, 2 and 3 shows the pooled values of both year observation highly significant value of plant height (68.697cm), no. of tillers clump⁻¹ (16.100), no. of leaves clump⁻¹ (136.557), no. of primary rhizomes (8.863), length of primary rhizomes (7.237cm), diameter of primary rhizomes (3.507cm), Number of secondary rhizome (12.387), length of secondary rhizome (4.547), diameter of secondary rhizome (3.043), rhizome yield plant⁻¹ and rhizome yield ha⁻¹ (434.133 gm plant⁻¹ & 34.730 t ha⁻¹) under the treatment T₁ as compared to the treatment of T₄ (38.20 cm, 6.52, 55.74, 4.29, 3.04 cm, 1.49 cm, 4.47, 1.60 cm, 1.17 cm, 1.173 gm plant⁻¹ and 15.497 tha⁻¹, respectively). This could be due to plastic mulch have fully suppressed the weeds growth, check the soil erosion, Greater uptake of nutrients and water availability to plants and thus minimized the crop-weed competition as compared to non-mulched condition, while in case of days to maturity plastic mulch was found higher (241.620 days) as compared to without mulch (200.870 days) similar result was found (Kalyankar *et al.*, 2011 and Reddy *et al.*, 2017). Followed by result shows that yield was plant⁻¹ (gm) and yield ha⁻¹ (t) at par of both treatment T₂ and T₃ (293.53gm, 23.480 t and 272.61 gm, 21.80 t, respectively) as compared to without mulch (1.173 gm plant⁻¹ and 15.497 t ha⁻¹).

Table.1 Effect of mulch materials on growth parameter in ginger

Treatment	Plant height (cm)	No. of tillers/clump	Number of leaves/clump	Days to maturity
T ₁	68.697	16.100	136.557	241.620
T ₂	50.990	12.577	92.177	230.923
T ₃	44.920	12.307	84.700	234.740
T ₄	38.200	6.523	55.747	200.870
C.D. (P=0.05)	13.864	2.785	17.679	4.676
SE(m)	3.930	0.789	5.011	1.325
SE(d)	5.558	1.116	7.087	1.874
C.V.	13.425	11.513	9.405	1.011

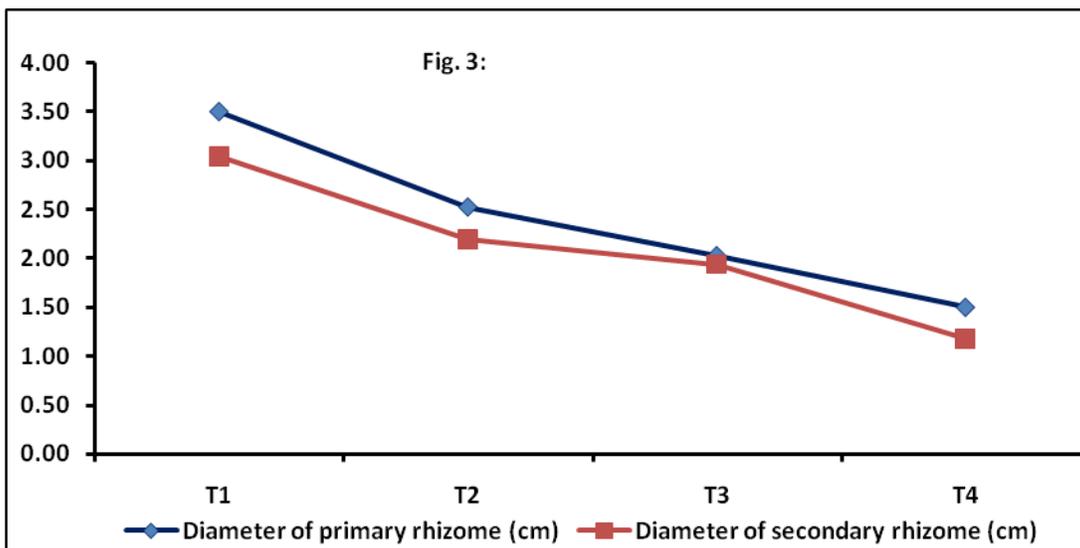
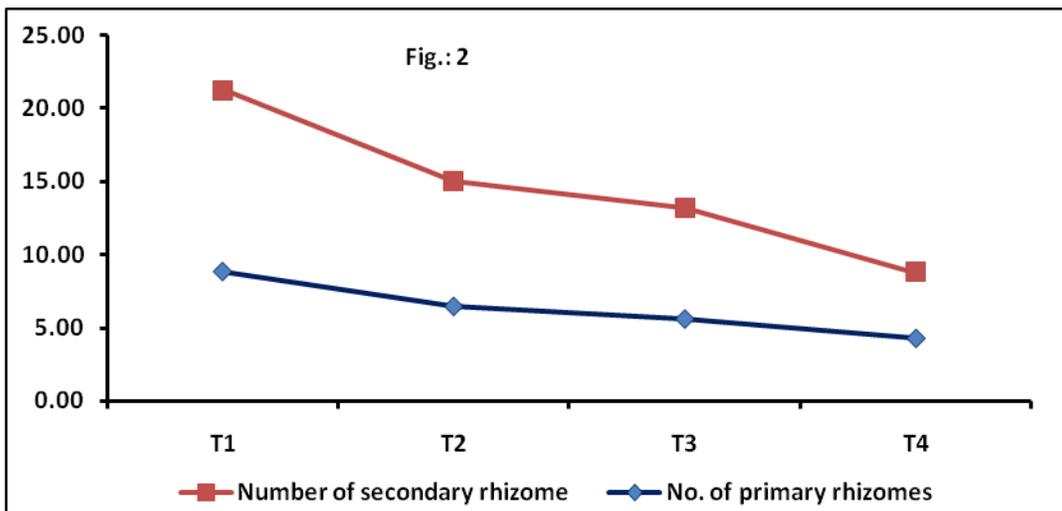
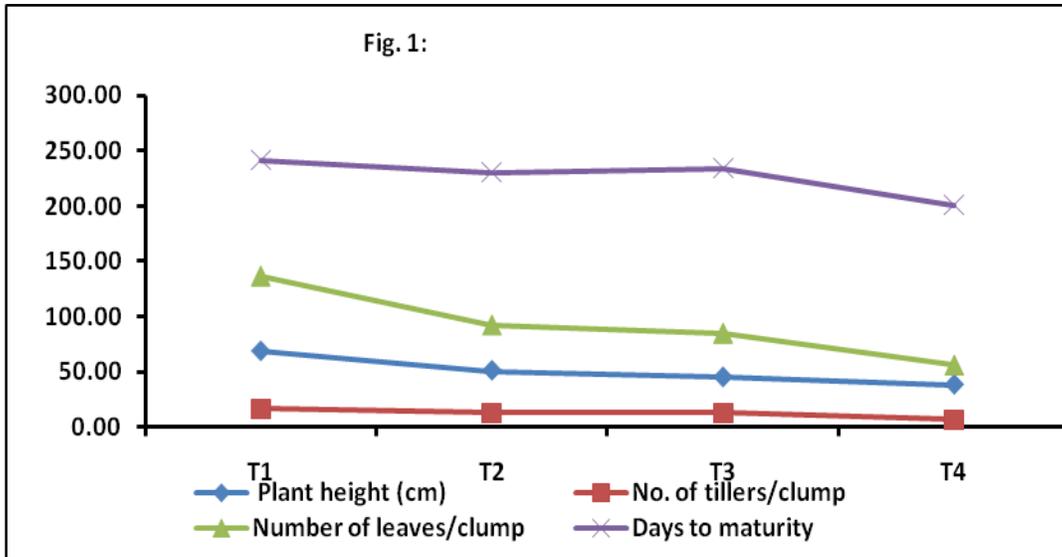
Table.2 Effect of mulch materials on rhizome yield parameter in ginger

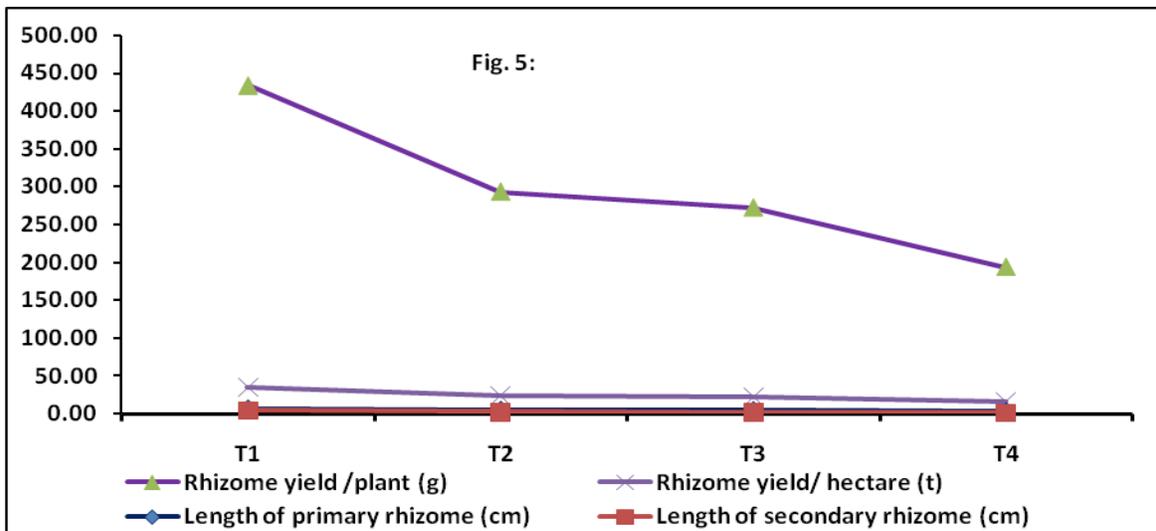
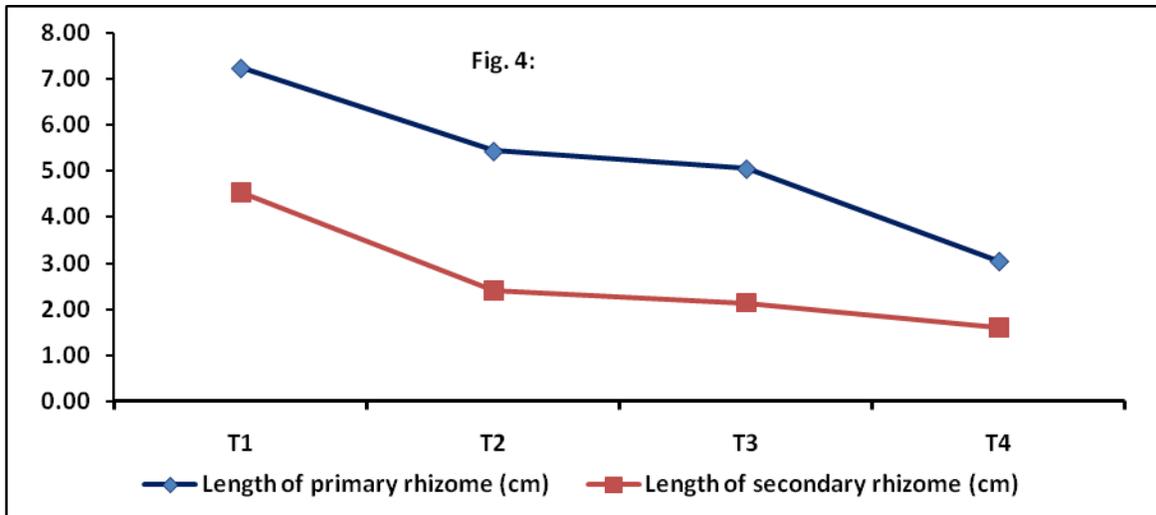
Treatment	No. of primary rhizomes	Length of primary rhizome (cm)	Diameter of primary rhizome (cm)	Number of secondary rhizome
T ₁	8.863	7.237	3.507	12.387
T ₂	6.487	5.433	2.527	8.540
T ₃	5.630	5.050	2.027	7.533
T ₄	4.297	3.043	1.497	4.477
C.D. (P=0.05)	2.724	2.307	1.044	1.817
SE(m)	0.772	0.654	0.296	0.515
SE(d)	1.092	0.925	0.419	0.728
C.V.	21.159	21.817	21.455	10.834

Table.3 Effect of mulch materials on rhizome yield parameter in ginger

Treatment	Length of secondary rhizome (cm)	Diameter of secondary rhizome (cm)	Rhizome yield /plant (g)	Rhizome yield/ hectare (t)
T ₁	4.547	3.043	434.133	34.730
T ₂	2.403	2.197	293.533	23.480
T ₃	2.143	1.937	272.617	21.807
T ₄	1.603	1.173	193.803	15.497
C.D. (P=0.05)	1.578	NS	63.944	5.116
SE(m)	0.447	0.384	18.126	1.450
SE(d)	0.633	0.543	25.634	2.051
C.V.	28.981	31.880	10.517	10.519

T₁ - Silver color plastic mulch
 T₂ - Green leaves of *Butea monosperma*
 T₃ - Paddy straw
 T₄ - Without mulch (control)





Tree leaf and paddy straw as mulch have been reported to increase the yield of ginger in Bihar (Jha *et al.*, 1986). The higher rhizome yield with organic mulches was due to the improved growth attributes, reduced competition by weeds and improved soil conditions. The increased the yield in treatment of plastic mulch (T₁) 124.20% as compared to control (15.49 t ha⁻¹). There was significant increase in yield under drip in combination with plastic mulch as compared to drip with organic mulch and drip alone without mulch.

Treatments silver color of plastic mulch materials with drip irrigation showed highest

value of plant height, no. of tillers clump⁻¹, number of leaves clump⁻¹, days to maturity, number of primary rhizomes, length and diameter of primary rhizomes, number of secondary rhizomes, length and diameter of secondary rhizomes, rhizomes yield plant⁻¹ and ha⁻¹ under the treatment T₁ and lowest under the treatment T₄.

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