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Effect of different mulches on vegetative growth, quality and flower yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda

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Abstract
The present experiment was conducted to determine the effect of different mulches on growth and flower yield of African marigold (*Tagetes erecta* L.) in the Department of Horticulture, AKS University, Sherganj, Satna. The experiment was laid out in simple RBD with three replications and ten treatments. Studies showed significant effect on the height of plant (92.61cm), number of branches per plant (18.31), number of leaves per plant (94.82), first day to bud appearance (47.12 day), stalk length of flower (8.89cm), flower diameter (7.41cm), number of flowers per plant (40.44), weight of flowers (10.46 g), flower yield per plant (423.00g), flower yield per plot (3807.00 g) and flower yield per hectare (38.07 t/ha) shelf life (6.11 days) of flower were produced by the treatment (T_4) Silver black polyethylene 200 µm gauge followed by (T_6) Paddy straw. Silver black polyethylene 200 µm gauge was the best mulch material for good vegetative as well as reproductive growth and quality in *rabi* season.

Keywords: Marigold, silver black polyethylene, paddy straw, coconut fibre

Introduction
African marigold (*Tagetes erecta* L.) is a widely cultivated as bedding plants, loose flower, perfume, natural colure, pigments, carotinoids, insect and nematodes repellents, nutrient supplement for poultry feed. Marigold plant habit of profuse flowering, short duration to produce marketable flowers, wide spectrum of attractive colures, shape and size and good keeping quality, attracted the attention producers and traders mostly. Marigold occupies anthelmintic, analgesic, anti-inflammatory, aromatic, bronchodilatory, digestive, diuretic, emmenagogue, sedative and stoma tic properties. African Marigolds are tall, erect-growing plants up to three feet in height. The flowers are globe-shaped and lager. Flowers may measure up to 5 inches across. African marigold is very good bedding plants. These flowers are yellow to orange and do not include red colored Marigold. Mulching is the process or practice of covering the soil/ground to make more favourable conditions for plant growth, development and efficient crop production. Mulch technical term means 'covering of soil'. While natural mulches such as leaf, straw, dead leaves and compost have been used for centuries, during the last 60 years the advent of synthetic materials has altered the methods and benefits of mulching. When compared to other mulches plastic mulches are completely impermeable to water; it therefore prevents direct evaporation of moisture from the soil and thus limits the water losses and soil erosion over the surface. In this manner it plays a positive role in water conservation. The suppression of evaporation also has a supplementary effect; it prevents the rise of water containing salt, which is important in countries with high salt content water resources.

Materials and Methods
A field experiment entitled "Effect of different mulches on vegetative growth, quality and flower yield of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda." was carried out at Horticultural Experimental Field, Department of Horticulture, Department of Horticulture, AKS University, Sherganj, Satna during rabi season. Ten treatments were included in the trial *viz*; T_1 (Control), T_2 (Black polyethylene 200 µm gauge), T_3 (Green polyethylene 200 µm gauge), T_4 (Blue polyethylene 200 µm gauge), T_5 (Silver polyethylene 200 µm gauge), T_6 (Paddy straw), T_7 (Wheat straw), T_8 (Rice husk), T_9 (Coconut fibre) and T_{10} (Saw dust) were tested in three replication. Seeds of African marigold cultivar 'Pusa Narangi Gainda' were procured from Department of Horticulture, AKS University, Sherganj, Satna.

The seeds were sown on 25th September, 2019 to raise the nursery in size (1.0 x 3.5 m). Experimental plot was ploughed and well decomposed farmyard manure was applied one month before planting of seedling. The experimental area was laid out in flat beds of size (1.5 x 3.0 m) and before transplanting of the seedling the NPK was applied at the rate of recommended dose and mixed well in the soil. Plastic and organic mulches are used before transplanting of the seedlings. Irrigation was given to the plots only the outer channel of mulched bed with two days prior to the transplanting of the seedlings. So that seedlings could be transplanted in well moist soil. Gap filling was done when ever required during the first two weeks after transplanting. Rest half dose of urea was applied in liquid form as drenching and foliar spray at the growth period.

Result and Discussion

In the present investigation, significant difference were observed among all mulches providing the scope of improvement on vegetative growth, quality and flower yield of African marigold cv. Pusa Narangi Gainda (Table 1). A perusal of data clearly revels that covering of mulches have influenced Plant height significantly. The maximum plant height (92.61 cm) was observed in the treatment T_4 (Silver black polyethylene 200 µm gauge) followed by treatment T_6 (Paddy straw) 87.90 cm. The plant height was found to be minimum 50.13 cm in the treatment T_1 (Control -Without mulching). It is evident from above result that the plant height was clearly affected with mulching. The treatment (T_4) with Silver black polyethylene 200 µm gauge showed best growth at all stages, followed by treatment (T_6) with Paddy straw. This is probably due to the different mulches by provided favorable moister and temperature to the plants. Similar results were also reported by Nagaich *et al.* (2003) [9], Acharya and Dashora (2004) [2] found in Marigold. Dubey (2005) [5] in Gladiolus, Das and Mishra (2005) [4] in Marigold were also observed similar result in their experiments. The maximum number of branches per plant (18.31) was observed in the treatment (T_4) with Silver black polyethylene 200 µm gauge followed by treatment (T_6) with Paddy straw. The number of branches per plant was found to be minimum (8.90) in the treatment (T_1) with control. This may be ascribed to the fact that use of silver-black plastic mulch might have provided a favorable environment for the growth and development of plants. The results of the present investigation are also in close conformity with the findings of (Kumar *et al.*, 2003) [8], Nagaich *et al.* (2003) [9], Acharya and Dashora (2004) [2], Das and Mishra (2005) [4] and Ahamd *et al.* (2010) [1] in Marigold were also observed similar result in their experiments. The number of leaves per plant was recorded as affected by different types of mulches is furnished in (Table.1). The maximum number of leaves per plant (94.82) was observed in the treatment (T_4) with Silver black polyethylene 200 µm gauge followed by treatment (T_6) with Paddy straw. The number of leaves per plant was found to be minimum (40.51) in the treatment (T_1) with control. Similar results were also reported by Nagaich *et al.* (2003) [9] in Marigold, Dubey (2005) [5] found in Gladiolus, Javed *et al.* (2005) [7] in marigold. The number of days for bud initiation was found to be minimum (33.33) was observed in the treatment (T_4) with Silver black polyethylene 200 µm gauge followed by treatment (T_5) with Black polyethylene 200 µm gauge (35.24). The number of days for bud initiation was found to be maximum (59.33) in the treatment (T_1) with control. The possible reason highest number of days taken for bud initiation by the treatment (T_1) with control may be due to the promotion of less vegetative growth by no mulch and results in the delaying in bud initiation. Similar results were also reported by Ahamd *et al.* (2010) [1] in Marigold. It is recorded that the treatment (T_4) with Silver black polyethylene 200 µm gauge has maximum flower stalk length (8.89 cm) followed by treatment (T_5) with Black polyethylene 200 µm gauge (8.54 cm). The stalk length of flower was found to be minimum (4.25 cm) in treatment (T_1) with control. Similar results were also reported by Verma (2014) [14] in Marigold. The uses of Silver black polyethylene 200 µm gauge (T_4) has resulted maximum diameter of flower (7.41 cm) followed by treatment (T_6) with Paddy straw (7.27 cm). The diameter of flower was found to be minimum (3.85 cm) in treatment (T_1) with control. Similar results were also reported by Acharya and Dashora (2004) [2] found in marigold, Gaikwad *et al.* (2004) [6] in China aster, Singh *et al.* (2008) [6] in Lily were also observed similar result in their experiments. It is clearly indicated that the treatment (T_4) with Silver black polyethylene 200 µm gauge has maximum flowers per plant (40.44) followed by treatment (T_6) with Paddy straw. The number of flowers per plant was found to be minimum (17.33) in treatment (T_1) with control. Similar results were also reported by Gaikwad *et al.* (2004) [6] found in China aster. It is recorded that the treatment (T_4) with Silver black polyethylene 200 µm gauge has maximum weight of flower (10.46 g) followed by treatment (T_6) with Paddy straw (9.90 g). The weight of flower was found to be minimum (8.23 g) in treatment (T_1) with control. Similar results were also reported by Niedziela *et al*. (2008) [11] in Lily, Ahamd *et al.* (2010) [1] in Marigold. It is recorded that the treatment (T_4) with Silver black polyethylene 200 µm gauge has maximum flower yield (38.07 t ha^{-1}) followed by treatment (T_6) with Paddy straw (32.67 t ha^{-1}). The flower yield per hector was found to be minimum (12.84 t ha^{-1}) in treatment (T_1) with control. It is evident from the above result that the average flower yield per hectare was clearly affected with mulches. Similar results were also reported by Das and Mishra (2005) [4], Pal and Ghosh (2010) [12] and Chaudhary *et al*. (2008) [3] in Marigold. There was significant difference in shelf life of flowers as influenced by different mulches. The maximum shelf life (6.11 days) of flower was recorded in the treatment (T_4) with Silver black polyethylene 200 µm gauge followed by treatment (T_6) with Paddy straw (5.95 days) shorter shelf life was noticed) in treatment (T_1) with control under room condition. Increased shelf life of marigold flower might be due to the mulch materials and higher retention of water in the cells of flowers and lower desiccation. These findings are confirmed with the work of Naik *et al.* (2019) [10] and Verma (2014) [14] in Marigold.

Table 1: Influence of different dose of N, P and K on growth and floral characters on pinched seedling plants of African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gainda

Treatments	Plant height (cm)	Number of branches per plant	Number of leaves per plant	Number of days required for first flower bud emergence	Stalk length (cm)	Diameter of flower	Total number of flowers per plant	Weight of flowers	Flower yield per plant (gm)	Flower yield per plot	Flower yield per hectare	Shelf life of flowers (days)
T_1 Control (Without mulching)	50.13	8.90	40.51	59.33	4.25	3.85	17.33	8.23	142.63	1283.67	12.84	3.26
T_2 Green polyethylene 200 µm gauge	80.77	14.32	71.59	47.12	7.14	6.17	28.67	9.45	270.93	2438.37	24.38	5.70
T_3Blue polyethylene 200 µm gauge	83.23	15.19	79.45	38.56	7.48	6.45	30.27	9.54	288.77	2598.93	25.99	5.85
T_4 Silver black polyethylene 200 µm gauge	92.61	18.31	94.82	33.33	8.89	7.41	40.44	10.46	423.00	3807.00	38.07	6.11
T_5 Black polyethylene 200 µm gauge	85.46	15.70	82.01	35.24	8.54	7.13	34.33	9.60	329.57	2966.13	29.66	5.94
T_6 Paddy straw	87.90	16.50	88.11	49.45	8.25	7.27	36.67	9.90	363.03	3267.27	32.67	5.95
T_7 Wheat straw	78.77	12.80	66.05	51.99	6.87	6.02	26.55	9.38	249.04	2241.36	22.41	5.34
T_8 Rice husk	75.83	12.43	63.05	52.23	6.13	5.54	23.27	9.29	216.18	1945.62	19.46	4.98
T_9 Coconut fibre	69.02	10.55	52.12	55.63	5.38	5.05	21.67	8.80	190.70	1716.30	17.16	4.73
T_{10} Saw dust	73.53	11.32	57.25	53.42	5.85	5.26	22.33	9.06	202.31	1820.79	18.21	4.55
S. Ed. (±)	0.20	0.24	1.15	0.71	0.08	0.09	0.65	0.09	5.35	32.99	4.23	1.13
C. D. (P = 0.05)	0.41	0.48	2.43	1.52	0.20	0.15	1.33	0.22	9.98	75.43	12.45	2.29

Conclusion

The present investigation revealed that treatment (T_4) with Silver black polyethylene 200 µm gauge was found the best treatment in terms of vegetative growth, flower yield (38.07 t ha^{-1}) and quality in African marigold cv. Pusa Narangi Gainda in *rabi* season.

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