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## Effect of different plastic mulches and nutrient spray on flowering and seed production in Calendula

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#### Abstract

The experiment was conducted with four levels of nutrient spray of NPK (19:19:19)@, 0gm, 10gm, 20 gm, 30 gm/litre and four mulching treatments viz. no mulch, black mulch, yellow mulch and transparent mulch. The vegetative, floral and seed characters showed an increasing trend with increase in the dosage of nutrient sprays up to 20 g/litre NPK (19:19:19) thereafter it remained more or less uniform at 30 g/litre NPK (19:19:19) and both treatments were statistically at par with each other for most of the characters. So nutrient spray of NPK (19:19:19) @ 20 g/litre was found to be best for enhancing the growth, flower and seed parameters of calendula. Among different polythene mulches, black coloured polythene mulch followed by yellow coloured mulch was found to be best in recording improved vegetative, flower and seed production characters of calendula. The dry mass of weed was found to be greater in the plots having no mulch followed by the plots covered with transparent polythene mulch. Zero percent of weed infestation was reported in plots covered with black and yellow coloured mulches. Among interactions Fertigation with water soluble fertilizers @30 g/lit and black mulching recorded highest values for growth, flowering and yield parameters.

**Keywords:** Nutrient sprays, mulching

#### Introduction

Calendula (*Calendula officinalis* L) is one of the most commonly cultivated seasonal flowers. Calendula is a winter season annual, which is grown extensively in beds, baskets and boxes. It is also known as English marigold or pot marigold. The word "Calendula" has been derived from Latin word. Kalwndae, meaning first day of the month. It is gaining popularity as a cut flower. It gives a beautiful effect with red salvia, phlox and snapdragons and appeals the people who enjoy various colours. Fertigation is a method of fertilization in which nutrients along with water are applied directly to the root zone of the plant in small but frequent quantities through the drippers<sup>[1, 2]</sup>. The timing and rate of irrigation should be adjusted to correspond to the plants water demand with an ambition to produce good yields of prime quality. Compared to furrow irrigation, drip irrigation provides better water use efficiency. Mulching increases the soil temperature and moisture; control the weeds besides improving the chemical and physical properties of soil thereby improving the productivity of the crop. In the era of declining resources there is need to standardize precision farming technologies for farmers with the aim to enhance the productivity and to reduce water foot print per unit of crop produce. Therefore, the present study aimed to examine the effect of nutrient sprays and mulching on the productivity of calendula.

#### Materials and Methodology

The experiment was conducted is Latin Square design (LSD) with 16 treatments with 3 replications. Seedlings were planted in the bed field of Division of Floriculture and Landscape Architecture during November 2019 to May 2020. Total number of treatments were 12 viz. T0 (Control), T1 (NPK 19:19:19@10 g with no mulch), T2 (NPK 19:19:19 @10 g with black mulch), T3 (NPK 19:19:19@10 g with yellow mulch), T4 ((NPK 19:19:19@10 g with transparent mulch), T5 (NPK 19:19:19@20 g with no mulch), T6 (NPK 19:19:19@20 g with black mulch), T7 (NPK 19:19:19@20g with yellow mulch), T8 (NPK 19:19:19@20 g with transparent mulch), T9 (NPK 19:19:19@30 g with no mulch), T10 (NPK 19:19:19 @30 g with black mulch), T11 (NPK 19:19:19@30 g with yellow mulch)T12 (NPK 19:19:19@30 g with transparent mulch).

## Results and Discussions

### Fertigation and mulching

The Nutrient sprays with NPK 19:19:19 and mulching had significant effect on the growth, flowering and yield parameters. The results among nutrient sprays and mulching treatments, nutrient spray of NPK (19:19:19) @ 30 g/litre with black mulching was found to be best for enhancing the growth, flower and seed parameters of calendula. Application of water soluble fertilizers and black mulching recorded highest values for parameters like plant height (47.10 cm), plant spread (45.09 cm), number of branches per plant (23.22), number of flowers per plant (48.22), flower weight (4.97 g), flower diameter (6.25 cm), seed yield (17.11 gm/m<sup>2</sup>). The increase in vegetative parameters through

fertigation was obtained due to availability of the WSF at rhizosphere with reduced nutrient losses by leaching and efficient use of nutrients through fertigation<sup>[3]</sup> (Table 1–3). Similar results were given by<sup>[4]</sup> in calendula,<sup>[5]</sup> in marigold. The increase in growth under black polythene mulch might be due to conservation of soil moisture and moderating soil temperature for improved root growth and better absorption of nutrients with better weed control. Similar results were obtained in<sup>[6]</sup> in China aster. Highest flower diameter due to proper fertigation and high amount of application of fertilizers and due to the role of nitrogen in protein synthesis and augmenting growth. Identical results on gerbera were obtained by<sup>[7]</sup> in gerbera,<sup>[8]</sup> in gladiolus.

**Table 1:** Effect of different mulches and nutrient sprays on vegetative parameters of calendula

	Plant height					Plant Spread (cm)				
	No much	Black mulch	Yellow	Transparent	Mean	No much	Black mulch	Yellow	Transparent	Mean
NPK (19:19:19) @ 0 g/litre	33.11	37.66	36.22	35.00	35.50	35.19	39.19	38.33	36.10	46.08
NPK (19:19:19) @ 10 g/litre	34.33	42.89	38.44	36.67	38.08	37.35	42.65	40.15	38.15	49.09
NPK (19:19:19) @ 20 g/litre	36.44	46.22	43.22	38.44	41.08	38.44	44.25	42.35	39.22	51.34
NPK (19:19:19) @ 30 g/litre	37.00	47.10	45.33	38.22	41.91	39.11	45.09	42.10	39.33	51.89
Mean	35.22	43.47	40.80	37.08		37.52	42.80	40.73	38.20	
LSD (5%)	Mulches (1.35); Nutrient sprays (1.63); Interaction (2.98)					Mulches (0.481); Nutrient sprays (1.98); Interaction (2.46)				

**Table 2:** Effect of different mulches and nutrient sprays on number of branches and flowers of calendula

	Number of branches per plant					Number of flowers per plant				
	No much	Black mulch	Yellow mulch	Transparent mulch	Mean	No much	Black mulch	Yellow	Transparent	Mean
NPK (19:19:19) @ 0 g/litre	09.11	17.55	15.11	12.33	13.53	34.11	42.55	40.11	37.33	38.53
NPK (19:19:19) @ 10 g/litre	12.33	20.00	17.22	14.44	15.10	37.33	45.00	42.22	39.44	40.10
NPK (19:19:19) @ 20 g/litre	15.77	22.33	19.44	17.77	18.83	40.77	47.33	44.44	42.77	43.83
NPK (19:19:19) @ 30 g/litre	16.00	23.22	20.00	18.11	19.33	41.00	48.22	45.00	43.11	44.33
Mean	13.30	20.78	17.94	15.66		38.30	45.78	42.94	40.66	
LSD (5%)	Mulches (0.95); Nutrient sprays (1.15); Interaction (2.10)					Mulches (0.86); Nutrient sprays (1.07); Interaction (1.93)				

**Table 3:** Effect of different mulches and nutrient sprays on flower characters of calendula

	Flower weight (g)					Flower diameter (cm)				
	No much	Black mulch	Yellow	Transparent	Mean	No much	Black mulch	Yellow	Transparent	Mean
NPK (19:19:19) @ 0 g/litre	3.10	4.25	4.19	3.82	3.84	4.11	5.15	5.11	4.50	4.72
NPK (19:19:19) @ 10 g/litre	3.44	4.35	4.25	4.00	4.01	4.53	5.50	5.40	5.22	5.16
NPK (19:19:19) @ 20 g/litre	3.65	4.78	4.45	4.11	4.25	5.32	6.11	5.60	5.50	5.63
NPK (19:19:19) @ 30 g/litre	3.65	4.97	4.50	4.20	4.28	5.50	6.25	5.60	5.55	5.73
Mean	3.41	4.59	4.35	4.03		4.87	5.75	5.40	5.19	
LSD (5%)	Mulches (0.37); Nutrient sprays (0.19); Interaction (0.56)					Mulches (0.28); Nutrient sprays (0.31); Interaction (0.59)				

**Table 4:** Effect of different mulches and nutrient sprays on yield parameters of calendula

	Seed yield (g) per plant					Seed yield (g) per m <sup>2</sup>				
	No much	Black mulch	Yellow	Transparent	Mean	No much	Black mulch	Yellow	Transparent	Mean
NPK (19:19:19) @ 0 g/litre	12.11	14.12	13.11	12.50	12.96	108.99	127.08	117.99	112.50	116.64
NPK (19:19:19) @ 10 g/litre	12.50	13.33	14.50	13.50	13.46	112.50	119.97	130.50	121.50	121.12
NPK (19:19:19) @ 20 g/litre	14.39	16.98	15.80	15.44	15.65	129.51	152.82	142.20	138.96	140.87
NPK (19:19:19) @ 30 g/litre	14.50	17.11	15.50	15.45	15.64	130.50	153.99	139.50	139.05	140.76
Mean	13.38	15.39	14.73	14.22		120.38	138.47	132.55	128.00	
LSD (5%)	Mulches (0.63); Nutrient sprays (0.42); Interaction (1.05)					Mulches (3.58); Nutrient sprays (2.67); Interaction (6.25)				



**Fig 1:** Mulching



**Fig 2:** Fertigation

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