International Journal of Environment and Climate Change

Volume 13, Issue 1, Page 143-155, 2023; Article no.IJECC.96522
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Effect of Organic and Inorganic Mulches for Growth, Flowering and Yield Parameters on Ridge Gourd Variety Arka Prasan

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i11646

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/96522

Original Research Article

Received: 01/12/2022
Accepted: 02/02/2023
Published: 06/02/2023

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ABSTRACT

Aim: To study about the effect of organic and inorganic mulches on ridge gourd.
Study Design: The experiment was carried out with 7 treatments in Randomized Block Design (RBD) with three replications.
Place and Duration of Study: Research trial was carried out at P.G block, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad during *Kharif*, 2021 and Summer, 2022.
Results: Among the organic and inorganic mulches treatments, the results reported that the silver black polyethylene mulch recorded highest in growth, flowering and yield parameters compared to other mulches.

Keywords: Ridge gourd; organic mulches; inorganic mulches; arka prasan.

1. INTRODUCTION

Ridge gourd (*Luffa acutangula* L. Roxb; family Cucurbitaceae), also known as kalitori, angled gourd, silky gourd, Chinese okra, and ribbed gourd. It has chromosome number 2n = 26, and is native to India. Most of the cucurbitaceous vegetables are usually cultivated in relatively small areas for local consumption. In India, gourds are cultivated in an area of 4.52 lakh hectares with a production of 36.16 lakh MT [1] and in Telangana the crop is grown in an area of 14,087 hectares with a production of 2.82 lakh MT and productivity of 20 MT [2].

According to [3], the use of mulches on plots produced higher yield and compensate additional cost of input. Different types of materials like wheat straw, rice straw, plastic film, grass, wood, sand, etc. are used as mulches to moderate soil temperature and increase water infiltration during intensive rain [4].This is also supported by [5] who concluded that mulching can be used to increase soil temperature, conserve water, enhance flowering period, reduce days to first harvest, and increase the yield of crop. Therefore, considering the importance of different mulching in various vegetable crops, data and the facts, present investigation entitled Studies on effect of mulches on growth and yield of ridge gourd (*Luffa acutangu*la L.)" was planned to be carried out in growing region of Hyderabad, Telangana, India

2. MATERIALS AND METHODS

2.1 The Experimental Site

The present investigation was carried out during *Kharif,* 2021 and Summer, 2022 at P.G block, College of Horticulture, Rajendranagar, SKLTSHU, Hyderabad, India. The experimental site is situated at a latitude of 17^0.32' North, longitude of 78^0.40' East and altitude of 542.3 m above mean sea level.

2.2 The Biological Materials

Arka Prasan is an open pollinated variety seeds which is taken for the experimental work

2.3 The Experimentally Variants and the Experiment Design

The plots were demarcated into three [3] replications, each replication with seven treatments and experimental design followed is Randomized Block Design (RBD) replicated thrice consisting of Paddy straw- T_1, Paddy husk- T_2, Groundnut shell- T_3, Leaf mould-T_4, Silver black polyethylene sheet-T_5, Clear transparent polyethylene mulch-T_6 and Control-T_7 which replicated thrice.

Silver black polyethylene mulch and clear transparent polyethylene mulch was spread over on raised beds on which the seedlings holes of 4-5 cm diameter were made with recommended spacing 1.5 × 1 m^2 and 3-5 cm of moist soil was put at the base of the stem of transplanted seedling to conserve moisture. The organic mulches like paddy straw, paddy husk, groundnut shell and leaf mould mulch of 5cm thickness was spread manually as carpet on raised beds on respective treatments at 5 days after planting. All cultural practices were followed during the entire crop period.

2.4 The Parameters Determined

2.4.1 Growth parameters

The data recorded on growth parameters like vine length (cm), vine diameter (mm), number of

leaves per vine, leaf area (cm^2), leaf area Index, SPAD chlorophyll meter readings.

2.4.2 Flowering parameters

The parameters like days to first male flower, days to first female flower, days to 50 per cent flowering, sex ratio.

2.4.3 Yield parameters

The data recorded on yield parameters like days to first fruit harvest, days to last fruit harvest, fruit length (cm), fruit width (mm), average fruit weight (g), number of fruits per vine, fruit yield per vine (kg), fruit yield per plot (kg), fruit yield per hectare (tonnes).

2.5 Statistical Analysis

The experimental data collected on various growth, flowering and yield components of plant were subjected to Fisher's method of "Analysis of variance" (ANOVA) as outlined by [6] were analysed.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

3.1.1 Vine length (cm)

The data pertaining to vine length in Table 1 as influenced by the effect of mulching revealed that during *Kharif* season, significantly maximum vine length (83.92, 268.49 and 385.07 cm at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (80.30, 259.54 and 373.45 cm respectively). The minimum vine length (65.47, 223.50 and 325.77 cm at 30, 60 and 90 days after sowing (DAS), was recorded with T_7 (without mulch).

During Summer season, significantly maximum vine length (86.71, 274.84 and 389.60 cm at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (83.37, 263.65 and 377.58 cm respectively). The minimum vine length (66.95, 228.76 and 330.51 cm at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded maximum vine length. The beneficial effect in terms of conserving soil moisture and moderating soil temperature for improved root growth and better absorption of nutrients with better weed control might have contributed to increase in length of vine [7].

3.1.2 Vine diameter (mm)

The data revealed in Table 2 that during *Kharif* season, significantly maximum vine diameter (2.54, 3.29 and 3.86 mm at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (2.39, 3.20 and 3.81 mm respectively). The minimum vine diameter (1.96, 2.50 and 2.85 mm at 30, 60 and 90 days after sowing (DAS), was recorded with T_7 (without mulch).

Table 1. Effect of mulching on vine length (cm) of ridge gourd at different days after sowing (DAS)

	30 DAS		60 DAS		90 DAS	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	76.53	79.12	245.83	250.68	352.73	357.28
T_2 : Paddy husk	69.18	72.64	233.41	239.81	340.06	345.33
T_3 : Groundnut husk	75.04	78.33	240.05	248.18	343.54	347.65
T_4 : Leaf mould	67.26	69.29	231.22	235.71	339.81	342.86
T_5 : Silver black polythene sheet	83.92	86.71	268.49	274.84	385.07	389.60
T_6 : Clear transparent polythene sheet	80.30	83.37	259.54	263.65	373.45	377.58
T_7 : Without mulch	65.47	66.95	223.50	228.76	325.77	330.51
S.Em±	2.28	2.30	7.61	7.65	10.36	10.38
CD at 5%	7.04	7.10	23.45	23.57	31.92	32.00

Table 2. Effect of mulching on vine diameter (mm) of ridge gourd at different after sowing (DAS)

Treatments	30 DAS		60 DAS		90 DAS	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1: Paddy straw	2.31	2.40	2.87	3.06	3.66	3.69
T_2 : Paddy husk	2.25	2.28	2.56	2.66	2.99	3.12
T_3 : Groundnut husk	2.28	2.30	2.99	3.01	3.27	3.36
T_4 : Leaf mould	2.14	2.20	2.63	2.60	2.94	2.97
T_5 : Silver black polythene sheet	2.54	2.59	3.29	3.32	3.86	3.89
T_6 : Clear transparent polythene sheet	2.39	2.44	3.20	3.25	3.81	3.84
T_7 : Without mulch	1.96	2.03	2.50	2.52	2.85	2.87
S.Em±	0.07	0.07	0.08	0.09	0.10	0.10
CD at 5%	0.22	0.22	0.25	0.28	0.30	0.30

During Summer season, significantly maximum vine diameter (2.59, 3.32 and 3.89 mm at 30, 60 and 90 days after sowing (DAS), respectively) were observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (2.44, 3.25 and 3.84 mm respectively). The minimum vine diameter (2.03, 2.52 and 2.87 mm at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded maximum vine diameter. This might be due to plants under mulching were getting a warmer micro-climate during day time compared to non-mulched and resulted in increase in vine diameter of plants [8,9].

3.1.3 Number of leaves per vine

The data presented in Table 3 revealed that during *Kharif* season, significantly maximum number of leaves per vine (22.29, 63.27 and 98.93 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (21.69, 60.62 and 96.57 respectively). The minimum number of leaves per vine (12.74, 42.57 and 70.23 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

During Summer season, significantly maximum number of leaves per vine (22.81, 65.52 and 100.67 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (21.73, 63.78 and 96.81 respectively). The minimum number of leaves per vine (13.38, 44.93 and 73.27 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded maximum number of leaves per vine. The beneficial effect of mulching was greater in getting a warmer micro-climate during day time compared to non-mulched resulting in faster growth of plants. The hydrological process could be altered by mulching which results in improving soil productivity along with dropping evaporation and runoff, improving infiltration and soil temperature as well as enhancing biological activity and soil fertility [10].

3.1.4 Leaf area (cm^2)

The data presented in Table 4 revealed that during *Kharif* season, significantly maximum leaf area (49.58, 103.02 and 178.52 cm^2 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (45.95, 99.64 and 166.06 cm^2, respectively). The minimum leaf area (37.19, 72.79 and 93.77 cm^2 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

During Summer season, significantly maximum leaf area (54.71, 108.50 and 180.37 cm^2 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (50.84, 103.73 and 173.38 cm^2 respectively). The minimum leaf area (39.01, 80.71 and 99.38 cm^2 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

Table 3. Effect of mulching on number of leaves per vine of ridge gourd at different days after sowing (DAS)

	30 DAS		60 DAS		90 DAS	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	17.68	19.57	53.44	57.26	80.56	83.78
T_2 : Paddy husk	13.70	15.39	50.50	52.59	80.23	81.15
T_3 : Groundnut husk	15.01	18.48	51.81	52.73	79.09	82.62
T_4 : Leaf mould	13.46	15.06	45.59	46.05	72.77	75.45
T_5 : Silver black polythene sheet	22.29	22.81	63.27	65.52	98.93	100.67
T_6 : Clear transparent polythene sheet	21.69	21.73	60.62	63.78	96.57	96.81
T_7 : Without mulch	12.74	13.38	42.57	44.93	70.23	73.27
S.Em±	0.51	0.52	1.46	1.55	2.53	2.55
CD at 5%	1.56	1.60	4.49	4.79	7.80	7.85

Table 4. Effect of mulching on Leaf area (cm^2) of ridge gourd at different days after sowing (DAS)

	30 DAS		60 DAS		90 DAS	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	42.78	45.82	95.64	99.34	164.42	162.67
T_2 : Paddy husk	38.72	40.88	83.31	86.60	121.47	134.78
T_3 : Groundnut husk	39.22	42.45	89.72	92.53	132.27	138.81
T_4 : Leaf mould	37.63	39.73	81.10	85.70	114.08	124.89
T_5 : Silver black polythene sheet	49.58	54.71	103.02	108.50	178.52	180.37
T_6 : Clear transparent polythene sheet	45.95	50.84	99.64	103.73	166.06	173.38
T_7 : Without mulch	37.19	39.01	72.79	80.71	93.77	99.38
S.Em±	1.27	1.29	2.60	2.82	4.10	4.36
CD at 5%	3.91	3.98	8.01	8.69	12.62	13.45

In both the seasons, T_5 (Silver black polyethylene mulch) recorded maximum leaf area. It is in support of study that plastic mulches directly affect micro climate around plant by modifying radiation budget (absorbing vs reflectivity) of the surface and decreasing the soil water and nutrient loss [11].

Mulch could improve leaf photosynthetic capacity beside the role of polyethylene for enhancing root growth as well as, absorption of each of water drops and nutrients and thereby, enhanced metabolic activities within plant during the period of growth and reproduction process, which possessed leaf number, width of leaf area, leaf area index with high leaf chlorophyll content that induced more photosynthetic rates [12].

3.1.5 Leaf area Index

The data presented in Table 5 revealed that during *Kharif* season, significantly maximum leaf area index (0.136, 0.805 and 2.180 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) followed by T_6 (clear transparent polyethylene mulch) (0.123, 0.746 and 1.980 respectively). The minimum leaf area index (0.058, 0.383 and 0.813 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

During Summer season, significantly maximum leaf area index (0.154, 0.878 and 2.242 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) followed by T_6 (clear transparent polyethylene mulch) (0.136, 0.817 and 2.072 respectively). The minimum leaf area index (0.064, 0.448 and 0.899 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded maximum leaf area index. It is observed that plastic mulches

directly affect micro climate around plant by modifying radiation budget (absorbing vs reflectivity) of the surface and decreasing the soil water and nutrient loss [13].

Mulch could improve leaf photosynthetic capacity beside the role of polyethylene for enhancing root growth, thereby utilize each drop of water and nutrients and enhanced metabolic activities within plant during the period of growth and reproduction process develop leaves, width of leaf area, leaf area index with high leaf chlorophyll content which induce more photosynthetic rates [14].

3.1.6 SPAD chlorophyll meter readings

The data presented in Table 6 revealed that during *Kharif* season, significantly maximum SPAD chlorophyll meter readings (39.13, 42.14 and 45.43 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (35.92, 37.70 and 42.30 respectively). The minimum SPAD chlorophyll readings (30.03, 31.26 and 35.47 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

During Summer season, significantly maximum SPAD chlorophyll readings (39.22, 46.62 and 47.19 at 30, 60 and 90 days after sowing (DAS), respectively) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (37.91, 43.58 and 44.63 respectively). The minimum SPAD chlorophyll readings (30.97, 31.37 and 37.53 at 30, 60 and 90 days after sowing (DAS) was recorded with T_7 (without mulch).

Mulch could improve leaf photosynthetic capacity beside the role of polyethylene for enhancing root growth, as well as absorption of water and nutrients and thereby enhanced metabolic activities within plant during the period of growth and reproduction process. The enhanced leaf number, leaf width, leaf area, leaf area index with high leaf chlorophyll content induced more photosynthetic rate which increase the yields [15].

3.2 Flowering Parameters

3.2.1 Days to first male flower

From the data in Table 7, there was significant difference observed among the treatments with respect to days to first male flower during *Kharif* season. Significantly minimum days to first male flower (31.58 days) was recorded in T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (33.84 days), while the maximum days to first male flower (36.23 days) was recorded with T_7 (without mulch).

During Summer season, among all the treatments, T_5 (Silver black polyethylene mulch) recorded minimum days to first male flower (31.32 days) and was at par with T_6 (clear transparent polyethylene mulch) (32.74 days), while the maximum days to first male flower (36.61 days) was recorded with T_7 (without mulch).

In both the seasons, T5 (Silver black polyethylene mulch) recorded minimum days to first male flower. Early opening of male flowers due to the best treatments might be due to better nutritional status of the plant favoured by higher photosynthesis resulting in early initiation of flowering. [16].

3.2.2 Days to first female flower

From the data in Table 7, there was significant differences observed among the treatments with respect to days to first female flower during Kharif season. Significantly minimum days to first female flower (37.66 days) was recorded in T5 (Silver black polyethylene mulch) and was at par with T6 (clear transparent polyethylene mulch) (39.43 days), while the maximum days to first female flower (45.47 days) was recorded with T7 (without mulch).

Table 5. Effect of mulching on Leaf area Index of ridge gourd at different days after sowing (DAS)

	30 DAS		60 DAS		90 DAS	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	0.093	0.111	0.631	0.702	1.536	1.683
T_2 : Paddy husk	0.065	0.078	0.519	0.562	1.203	1.350
T_3 : Groundnut husk	0.073	0.097	0.574	0.601	1.292	1.416

Treatments	30 DAS		60 DAS		90 DAS	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_4 : Leaf mould	0.063	0.074	0.456	0.487	1.025	1.163
T_5 : Silver black polythene sheet	0.136	0.154	0.805	0.878	2.180	2.242
T_6 : Clear transparent polythene sheet	0.123	0.136	0.746	0.817	1.980	2.072
T_7 : Without mulch	0.058	0.064	0.383	0.448	0.813	0.899
S.Em±	0.001	0.001	0.007	0.008	0.017	0.019
CD at 5%	0.003	0.004	0.022	0.024	0.052	0.058

Table 6. Effect of mulching on SPAD chlorophyll content of ridge gourd at different days after sowing (DAS)

Treatments	30 DAS		60 DAS		90 DAS	
	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022	Kharif 2021	Summer 2022
T_1: Paddy straw	33.40	36.23	35.92	38.61	40.41	43.35
T_2 : Paddy husk	32.52	33.87	33.81	35.78	35.96	42.78
T_3 : Groundnut husk	32.73	34.54	34.05	37.24	38.70	39.66
T_4 : Leaf mould	30.27	32.46	33.61	33.85	35.79	37.81
T_5 : Silver black polythene sheet	39.13	39.22	42.14	46.62	45.43	47.19
T_6 : Clear transparent polythene sheet	35.92	37.91	37.70	43.58	42.30	44.63
T_7 : Without mulch	30.03	30.97	31.26	31.37	35.47	37.53
S.Em±	1.02	1.03	1.04	1.05	1.06	1.21
CD at 5%	3.13	3.18	3.19	3.23	3.26	3.74

During summer season among all the treatments, T_5 (Silver black polyethylene mulch) recorded minimum days to first female flower (36.26 days) and was at par with T_6 (clear transparent polyethylene mulch) (37.91 days), while the maximum days to first female flower (44.41 days) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded minimum days to female flower. Early opening of flowers could be attributed to the increased soil temperature of silver black plastic mulch which was directly related to early initiation of flowers [17,18].

3.2.3 Days to 50 per cent flowering

From the data in Table 7, there were significant difference observed among the treatments with respect to days to 50 per cent flowering during *Kharif* season. Significantly minimum days to 50 per cent flowering (49.49 days) was recorded in T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (51.73 days), while the maximum days to 50 per cent flowering (70.68 days) was recorded with T_7 (without mulch).

During Summer season among all the treatments, T_5 (Silver black polyethylene mulch) recorded minimum days to 50 per cent flowering (48.83 days) and was at par with T_6 (clear transparent polyethylene mulch) (50.60 days), while the maximum days to 50 per cent flowering (66.62 days) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded minimum days to 50 per cent flowering. Early opening of flowers due to the best treatments might be due to better nutritional status of the plant favouring higher photosynthesis resulting in early initiation of flowering [19].

3.2.4 Sex ratio

The data is presented in Table 7 revealed that during *Kharif* and Summer season, there was significant differences observed among all the treatments. Treatment T_5 (Silver black polyethylene mulch) expressed the narrow sex ratio (8.29 and 8.23) which was on par with the T_6 (clear transparent polyethylene mulch) (8.56 and 8.45) and T_1 (paddy straw) (8.68 and 8.59), whereas wider sex ratio (9.02 and 8.98) was observed in T_7 (without mulch) during *Kharif* and Summer seasons respectively.

In both the seasons, T_5 (Silver black polyethylene mulch) recorded the best values in terms of growth parameters and flowering parameters ultimately resulting in the narrowest sex ratio of this treatment when compared to the other treatments [20].

3.3 Yield parameters

3.3.1 Days to first fruit harvest

The data presented in Table 8 revealed that there were significant differences observed among the treatments with respect to days to first fruit harvest during *Kharif* season. Significantly minimum days to first fruit harvest (42.73 days) was recorded in T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (43.34 days), while the maximum days to first fruit harvest (50.92 days) was recorded with T_7 (without mulch).

During Summer season among all the treatments, T_5 (Silver black polyethylene mulch) recorded minimum days to first fruit harvest (42.22 days) and was at par with T_6 (clear transparent polyethylene mulch) (42.28 days), while the maximum days to first fruit harvest (48.86 days) was recorded with T_7 (without mulch).

3.3.2 Days to last fruit harvest

The data enunciated on days to last fruit harvest as influenced by the effect of mulching on yield in ridge gourd is presented in Table 8.

The data show that there were significant differences observed among the treatments with respect to days to last fruit harvest during *Kharif* season.

Table 7. Effect of mulching on days to first male flower, days to first female flower, days to 50 per cent flowering, sex ratio of ridge gourd

	Days to first male flower		Days to first female flower		Days to 50 per cent flowering		Sex ratio	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	34.21	33.65	40.66	39.65	58.05	55.62	8.68	8.59
T_2 : Paddy husk	35.06	34.93	40.92	40.83	65.64	62.73	8.70	8.64
T_3 : Groundnut husk	34.83	34.76	41.71	40.01	63.18	60.59	8.84	8.70
T_4 : Leaf mould	36.12	35.50	42.92	42.50	68.32	65.17	8.86	8.78
T_5 : Silver black polythene sheet	31.58	31.32	37.66	36.26	49.49	48.83	8.29	8.23
T_6 : Clear transparent polythene sheet	33.84	32.74	39.43	37.91	51.73	50.60	8.56	8.45
T_7 : Without mulch	36.23	36.61	45.47	44.41	70.68	66.62	9.02	8.98
S.Em±	0.49	0.48	0.59	0.58	0.90	0.86	0.12	0.12
CD at 5%	1.50	1.49	1.80	1.77	2.78	2.65	0.37	0.37

Table 8. Effect of mulching on days to first fruit harvest, days to last fruit harvest, fruit length (cm), fruit width (mm) of ridge gourd

	Days to first fruit harvest		Days to last fruit harvest		Fruit length (cm)		Fruit width (mm)	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	46.56	45.31	124.20	124.07	38.37	38.22	29.71	30.53
T_2 : Paddy husk	48.47	47.01	123.11	122.45	34.73	35.75	27.01	27.86
T_3 : Groundnut husk	47.81	46.43	125.06	123.78	35.52	36.37	27.91	28.75
T_4 : Leaf mould	49.16	47.65	120.32	122.05	33.07	33.81	24.35	27.48
T_5 : Silver black	42.73	42.22	134.43	134.67	42.25	44.63	34.07	35.30

	Days to first fruit harvest		Days to last fruit harvest		Fruit length (cm)		Fruit width (mm)	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
polythene sheet T_6 : Clear transparent polythene sheet	43.34	42.28	133.67	134.03	40.58	41.45	33.67	33.74
T_7 : Without mulch	50.92	48.86	118.68	120.23	32.40	34.58	24.02	26.60
S.Em±	0.67	0.65	1.69	1.70	1.05	1.06	0.98	0.99
CD at 5%	2.06	1.99	5.19	5.23	3.24	3.28	3.03	3.07

Significantly maximum days to last fruit harvest (134.43 days) was recorded in T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (133.67 days), while the minimum days to last fruit harvest (118.68 days) was recorded with T_7 (without mulch).

During Summer season among all the treatments, T_5 (Silver black polyethylene mulch) recorded maximum days to last fruit harvest (134.67 days) and was at par with T_6 (clear transparent polyethylene mulch) (134.03 days), while the minimum days to last fruit harvest (120.23 days) was recorded with T_7 (without mulch).

In both the seasons, T_5 (Silver black polyethylene mulch) recorded minimum days to first fruit harvest and maximum days to last fruit harvest. These could be attributed to the increased soil temperature of plastic mulch which was directly related to early days to fruit harvest and maximum days to last fruit harvest [21].

3.3.3 Fruit length (cm)

From the data in Table 8, it is clear that there was significant differences revealed among the treatments with respect to fruit length that during *Kharif* season. Significantly maximum fruit length (42.25 cm) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (40.58 cm). The minimum fruit length (32.40 cm) was recorded with T_7 (without mulch).

During Summer season among all the treatments, T_5 (Silver black polyethylene mulch) recorded maximum fruit length (44.63 cm) and was at par with T_6 (clear transparent polyethylene mulch) (41.45 cm). The minimum fruit length (34.58 cm) was recorded with T_7 (without mulch).

3.3.4 Fruit width (mm)

The data recorded on fruit width as influenced by the effect of mulching is presented in Table 8.

There were significant differences observed among the treatments with respect to fruit width during *Kharif* season. Significantly maximum fruit width (34.07 mm) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (33.67 mm). The minimum fruit width (24.02 mm) was recorded with T_7 (without mulch).

During Summer season among all the treatments, maximum fruit width (35.30 mm) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording the fruit width of 33.74 mm. The minimum fruit width (26.60 mm) was recorded with T_7 (without mulch).

Fruit length and fruit width influenced significantly which could be attributed to more conducive conditions for plant growth and production like lesser weed growth and conservation of moisture for a long time, thus resulting in increased uptake of nutrients and water by plants due to mulching [22,23].

3.3.5 Average fruit weight (g)

The data enunciated on the average fruit weight as influenced by the effect of mulching on yield in ridge gourd is presented in Table 9.

There was significant difference observed among the treatments with respect to average fruit weight during *Kharif* season. Significantly maximum average fruit weight (153.87 g) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording average fruit weight of 152.94 g. The minimum average fruit weight (136.28 g) was recorded with T_7 (without mulch).

During Summer season among all the treatments, maximum average fruit weight (157.53 g) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) (154.30 g). The minimum average fruit weight (137.04 g) was recorded with T_7 (without mulch).

Increase in weight of fruit under plastic mulch might be due to the increased uptake of nutrients by the plant, which resulted in more vigorous plant growth and production of more photosynthates and are translocated to the sink [24].

3.3.6 Number of fruits per vine

The data pertaining to number of fruits per vine as influenced by the effect of mulching on yield in ridge gourd is presented in the Table 9.

All the treatments differed significantly with respect to number of fruits per vine during *Kharif* season. Significantly maximum number of fruits per vine (16.90) were observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording number of fruits per vine of 16.36. The minimum number of fruits per vine (11.97) was recorded with T_7 (without mulch).

During Summer season among all the treatments, maximum number of fruits per vine (16.96) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording number of fruits per vine of 16.75. The minimum number of fruits per vine (12.60) was recorded with T_7 (without mulch).

More number of fruits due to mulching could be due to its direct effect on suppressing weed flora and indirect effect on uptake of nutrients under the improved conditions of soil, particularly with respect to moisture availability and moderation of soil temperature. Moreover, mulching with plastic mulch resulted in increased length of main vine which might probably responsible for the greater number of fruits [25,26,27].

3.3.7 Fruit yield per vine (kg)

The data presented in Table 10 revealed that during *Kharif* season significantly maximum fruit yield per vine (2.60) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording the fruit yield per vine of 2.50. The minimum fruit yield per vine (1.63) was recorded with T_7 (without mulch).

During Summer season significantly maximum fruit yield per vine (2.67) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording the fruit yield per vine of 2.58. The minimum fruit yield per vine (1.73) was recorded with T_7 (without mulch).

Plants under polyethylene mulch (silver on top black at bottom) produced larger fruit and gave higher fruit yield per vine because of better plant growth due to favorable hydro-thermal regime of soil and complete weed free environment due to mulch [28].

3.3.8 Fruit yield per plot (kg)

The data presented in Table 10 revealed that during *Kharif* season, significantly maximum fruit yield per plot (25.84) was observed with T_5 (Silver black polyethylene mulch) followed by T_6 (clear transparent polyethylene mulch) recording the fruit yield per plot of 25.02. The minimum fruit yield per plot (16.31) was recorded with T_7 (without mulch).

Table 9. Effect of mulching on average fruit weight (g), number of fruits per vine of ridge gourd

	Average fruit weight (g)		Number of fruits per vine	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	143.21	150.72	14.27	14.75
T_2 : Paddy husk	138.82	145.64	13.43	13.52
T_3 : Groundnut husk	140.74	147.14	13.64	13.82
T_4 : Leaf mould	136.69	139.92	13.05	13.30
T_5 : Silver black polythene sheet	153.87	157.53	16.90	16.96
T_6 : Clear transparent polythene sheet	152.94	154.30	16.36	16.75
T_7 : Without mulch	136.28	137.04	11.97	12.60
S.Em±	1.92	1.98	0.19	0.19
CD at 5%	5.92	6.10	0.57	0.59

Table 10. Effect of mulching on fruit yield per vine (kg), fruit yield per plot (kg), fruit yield per hectare (t) of ridge gourd

	Fruit yield per vine (kg)		Fruit yield per plot (kg)		Fruit yield per hectare (t)	
Treatments	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**	**Kharif 2021**	**Summer 2022**
T_1: Paddy straw	2.04	2.22	20.44	22.23	18.92	20.58
T_2 : Paddy husk	1.86	1.97	18.64	19.69	17.26	18.23
T_3 : Groundnut husk	1.92	2.03	19.20	20.33	17.77	18.83
T_4 : Leaf mould	1.78	1.86	17.84	18.61	16.52	17.23
T_5 : Silver black polythene sheet	2.60	2.67	25.84	26.72	23.92	24.74
T_6 : Clear transparent polythene sheet	2.50	2.58	25.02	25.98	23.17	24.06
T_7 : Without mulch	1.63	1.73	16.31	17.27	15.10	15.99
S.Em±	0.03	0.03	0.26	0.28	0.24	0.25
CD at 5%	0.08	0.08	0.80	0.85	0.74	0.79

During Summer season, significantly maximum fruit yield per plot (26.72) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording the fruit yield per plot of 25.98. The minimum fruit yield per plot (17.27) was recorded with T_7 (without mulch).

3.3.9 Fruit yield per hectare (tonnes)

The data presented in Table 10 revealed that during *Kharif* season, significantly maximum fruit yield per hectare (23.92) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording the fruit yield per hectare of 23.17. The minimum fruit yield per hectare (15.10) was recorded with T_7 (without mulch).

During Summer season, significantly maximum fruit yield per hectare (24.74) was observed with T_5 (Silver black polyethylene mulch) and was at par with T_6 (clear transparent polyethylene mulch) recording the fruit yield per hectare of 24.06. The minimum fruit yield per hectare (15.99) was recorded with T_7 (without mulch).

The increased yield recorded due to plastic mulch could be attributed to more efficient weed suppression and conservation of soil moisture for a longer time which resulted in better growth and yield [29,30,31].

4. CONCLUSION

From the study it was concluded that different mulches have positive effect on growth and yield in ridge gourd. The silver black polyethylene mulch has shown best results compared to other mulches and proved to be the best treatment in ridge gourd

ACKNOWLEDGEMENT

The authors are highly thankful to SKLTSHU, Rajendranagar, Hyderabad for the help and support rendered in carrying out the research trial.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
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