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Application of different plastic mulches and cow urine on growth and flowering of cucumber

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Abstract

An experiment entitled, "Application of different plastic mulches and application of cow urine on growth and flowering of cucumber" was conducted at College farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Dist. Mehsana during summer season of 2019 comprising of two factors viz. different plastic mulches (bare soil, black plastic mulch, silver plastic mulch, red plastic mulch) in main plot with four levels (control, 5% cow urine, 10% cow urine, 15% cow urine) in sub plot with four levels. The total sixteen combinations were tested in Split Plot Design with three replications. Observations were recorded on growth and flowering parameters. Among the different types of plastic mulches, silver plastic mulch significantly increased vine length at 45, 60 and at harvest (77.30 cm, 163.77 cm and 246.33 cm, respectively), number of branches (15.11), minimum days taken to first male and female flower appearance (35.25 and 42.54, respectively), number of female and male flower (21.54, 160.52, respectively), percent fruit set (60.67%) and days taken to edible fruit maturity (3.76). All parameters showed a decreasing trend as compared to control condition. Among the application of cow urine, 15% cow urine significantly increased vine length at 45, 60 and at harvest (74.91 cm, 159.97 cm and 240.13 cm), number of branches (14.11), number of male flowers (163.50) and number of female flower (21.32).

Keywords: Mehsana, plastic, mulches, cow urine, cucumber

Introduction

Cucumber (*Cucumis sativus* L.) is one of the most popular, quickest maturing and widely grown vegetable. Generally in India organic mulches are used for moisture conservation and soil temperature moderation but it has partial control over these and has no reasonable control over weed growth. Use of plastics in agriculture knows plasticulture is becoming popular in Indian agriculture for boosting crop production LDPE (Low density polyethylene), HDPE (High density polyethylene) and flexible PVC have all been used for mulching. Majority of plastic mulch is based on LLDPE (Linear low-density polyethylene) because it is more economic in use. Now-a-days application of silver plastic mulch film is becoming popular and very good results on weed control in a range of crops. Red polythene mulch partially translucent allowing radiation to pass through and warm soil but also reflect radiation back into plant canopy changing ratio of R:FR light, which result in changes in plant vegetative, flower development and metabolism to early fruiting and increased yield in some vegetable crops. Black polyethylene mulch is used to exclude light and due to lack of photosynthesis, weeds are suppressed. Cow urine has a unique place in Ayurveda and has been described in 'Sushruta Samhita' and 'Astanga Sangraha' to be the most effective substance of animal origin with innumerable therapeutic values. Urine ready for nutrition of plants are require slight changes, whereas, solid dung needs to be decomposed. Before availability of nutrients to the plant though part of cattle dung is used as manure but cow urine usually drains out as waste material from farmer's household. However, cattle urine has a good manure value and can be utilized as a bio fertilizer (Singh *et al.*, 2012) [12]. Cattle urine is a good source of nitrogen, phosphate, potassium, calcium, magnesium, chlorite and sulphate. Cow urine contents water 95%, urea 2.5%, minerals, salt, hormones and enzymes 2.5%. It contains iron, calcium, phosphorus, potassium, urea, uric acid, amino acids, enzymes, cytokine and lactose etc. (Bhadauria, 2002) [11]. Further, organic nutrient spray (cow urine) can be sprayed at critical growth stage of crop to overcome the problem of the slow release nutrients of organic sources affecting crop growth. Application of cow urine besides improving the soil texture and working as a plant hormone also been reported to correct the micro nutrient deficiency.

Keeping into consideration the above fact an investigation entitled, "Application of different plastic mulches and application of cow urine on growth and flowering of cucumber" was taken.

Materials and Methods

The experiment entitled "application of different plastic mulches and application of cow urine on growth and flowering of cucumber" was undertaken during summer season of the year 2019 under field conditions at College farm, College of Horticulture, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Dist. Mehsana, Gujarat. This experiment was comprising of two factors *viz.* four levels of plastic mulches (m_0 -control, m_1 - black plastic mulch, m_2 - silver plastic mulch and m_3 -red plastic mulch) and application of cow urine (c_0 -0% cow urine, c_1 -5% cow urine, c_2 -10% cow urine and c_3 -15% cow urine) in Split Plot Design. Urine application was given at 20, 30 and 50 DAS. Irrigation was provided by drip irrigation system. Observations of growth parameters *viz.* vine length at 45 and 60 DAS and at last harvest (cm), number of branches at harvest and flowering parameters *viz.*, days taken for first male flower appearance, days taken for first female flower appearance, number of male flowers, number of female flowers, days taken for fruit set to edible maturity, percent fruit set and sex ratio. Statistical analysis of the data pertaining to growth and flowering parameters were analyzed as per the methods described by Panse and Sukhatme (1985)^[14].

Results and Discussion

On growth parameters (Table 1 and 2)

Vine length at 45 and 60 DAS and at last harvest (cm)

Significantly maximum vine length at 45, 60 DAS and at last harvest (77.30, 163.77, 246.33 cm, respectively) was found with treatment m_2 (silver plastic mulch) which was statistically at par with treatment m_1 (black plastic mulch) at 45, 60 and last harvest (74.33, 158.30 and 237.37 cm, respectively). Such results are the extended retention of moisture and availability of moisture also lead to higher uptake of nutrient for proper growth of plants, resulted higher vine length as compared to control. These findings are in accordance with findings of Rathava *et al.* (2015)^[16], Parmar *et al.* (2013)^[15] and Dadheech *et al.* (2018)^[7] in watermelon. The significantly maximum vine length at 45, 60 and at last harvest (74.91, 159.97 and 240.13 cm, respectively) was recorded with treatment c_3 (15% cow urine) being at par with 45, 60 DAS and at last harvest (72.49, 155.63, 233.94 cm, respectively) with treatment c_2 (10% cow urine). It may be due to cow urine is very useful in agricultural operation such as bio fertilizer, bio pesticide and rich source of macro, micronutrients and disinfectant and prophylactic properties thus purify the micro- climate and improve soil fertility (Choudhari and Shinde, 2017)^[6]. The similar results *i.e.* increase in cow urine concentration increased the performance of phenotypic characters of *methi* and *Bhindi* were reported by Jandaik *et al.* (2015)^[11]. Interaction effect of different plastic mulch and application of cow urine exhibited significant difference in vine length. Significantly highest vine length 45, 60 and at last harvest (86.97, 181.26 and 272.89 cm, respectively) recorded in the treatment combination of m_2c_3 which was at par with m_1c_3 , m_2c_2 and m_1c_2 . Such results are obtained on account of favorable condition available during growth period due to silver plastic

mulch and cow urine content auxins, which help to cell division and cell elongation. It promoted the growth therefore its interaction of m_2c_3 (silver plastic mulch+15% cow urine) produced higher vine length. These results are supported by the findings of Nayak *et al.* (2017)^[13] in pointed gourd.

Number of branches at harvest

Significant effect of different plastic mulches on number of branches was observed. The maximum number of branches (15.11) was observed under m_2 (silver plastic mulch) which was at par with (14.63) m_1 (black plastic mulch). It is due to these findings being attributed to maximum energy utilization received by seedlings on plastic mulch for higher biomass production and acumination, which ultimately increased number of branches. These findings are in accordance with findings of Rathava *et al.* (2015)^[16] and Dadheech *et al.* (2018)^[7] in watermelon. The significantly maximum number of branches (14.11) was recorded with treatment c_3 (15% cow urine) being at par with (13.46) with treatment c_2 (10% cow urine). The minimum number of branches (11.69) was observed with treatment c_0 (0% cow urine). It might be to the positive effect of different treatments, like other growth parameters, optimum environment condition and increased concentration of cow urine accelerate the vegetative growth of plant (Tamarkar *et al.*, 2016)^[20]. This finding is in accordance with the result of Cardoso *et al.* (2009)^[4] in egg plant. Significantly highest number of branches (16.59) recorded in the treatment combination of m_2c_3 which was at par with m_1c_3 , m_2c_2 and m_1c_2 . Such results are obtained on account of favorable condition available during growth period due to plastic mulch and cow urine used as a nitrogen source and contains significant levels of potassium and boron, which are helpful for the growth of the plant and higher production of bio mass. These results are supported by the findings of Nayak *et al.* (2017)^[13] in pointed gourd.

On flowering parameters (Table 1 and 2)

Days taken for first male flower appearance

Significantly minimum days taken for first male flower appearance (35.25) was recorded in treatment m_3 (silver plastic mulch) which was at par with (35.75) m_2 (black plastic mulch). Early flower initiation may be due to the surface colour of plastic mulch can change the quantity of light and spectral balance reaching plants with resulting effect on early initiation of flowers. In the other hand plastic mulches often, enhanced soil temperatures under the mulch covering and provided plant early season growth boost and higher growth may due to reflected sun light and less evapotranspiration and maintain soil moisture compare to black plastic mulch condition (Maida *et al.*, 2019)^[12]. These results are in close agreement with findings of Bhatt *et al.* (2011)^[2] and Webber *et al.* (2017)^[22] in summer squash and Khan *et al.* (2015)^[23] in sponge gourd.

Days taken for first female flower appearance

Significantly minimum days taken for first female flower appearance (42.54) was recorded in treatment m_3 (silver plastic mulch) which was at par with (42.72) m_2 (black plastic mulch). Early flower initiation may be due to the surface color of plastic mulch can change the quantity of light and spectral balance reaching plants with resulting effect on early initiation of flowers. In the other hand plastic mulches often, enhanced soil temperatures under the mulch covering and

provided plant early season growth boost and higher growth may due to reflected sun light and less evapotranspiration and maintain soil moisture compare to black plastic mulch condition (Maida *et al.* 2019) [12]. These results are in close agreement with findings of Bhatt *et al.* (2011) [2] and Webber *et al.* (2017) [22] in summer squash and Khan *et al.* (2015) [23] in sponge gourd.

Number of male flowers

Significantly maximum number of male flower (160.52) per plant was observed with treatment m₂ (silver plastic mulch) which was at par with (156.53) m₁ (black plastic mulch). Its might be due to increase in soil water contents with less evaporation and increasing temperature which helped for increasing number of male flowers. The results are close agreement with findings of Ekinci and Dursun (2009) [8] and Shinde *et al.* (2012) [18] in muskmelon and Rathava *et al.* (2015) [16] in watermelon. Maximum number of male flower (163.50) per plant was found in c₃ (15% cow urine), which was at par with (158.03) c₂ (10% cow urine). As per result indicate that 15% cow urine concentration increased male flower due to presence of hormone in it. According to Jandaik *et al.* (2015) [11] male flowers is determined by balance of auxin and gibberellic acid balance in favour of auxin resulting in formation of male flowers. These results are conformity with the finding of Chaudhari and Patel (2010) [5] in mango and Tambe *et al.* (2015) [21] in chilli. Significantly maximum number of male flower (178.54) recorded in the treatment combination of m₂c₃ which was at par with m₂c₂, m₁c₃ and m₁c₂. It is due to interaction of mulch and cow urine application in which mulch increased temperature and enhanced number of flower and cow urine application balance the auxin and gibberellic acid in favor of auxin resulting in formation of male flowers. These results are supported by the findings of Nayak *et al.* (2017) [13] in pointed gourd.

Number of female flowers

Significantly maximum number of female flower (21.54) per plant was observed with treatment m₂ (silver plastic mulch) which was at par with (20.59) m₁ (black plastic mulch). Its might be due to increase in soil water contents with less evaporation and increasing temperature, there for increasing temperature which enhance flowering. The results are in close agreement with findings of Ekinci and Dursun (2009) [8] and Shinde *et al.* (2012) [18] in muskmelon and Rathava *et al.*

(2015) [16] in watermelon. Maximum number of female flower (21.32) per plant was found in c₃ (15% cow urine). Which was at par with (20.90) c₂ (10% cow urine). The result indicated that 15% cow urine concentration increased female flower due to presence of hormone in it. According to Jandaik *et al.* (2015) [11] female flowers is determined by balance of auxin and gibberellic acid balance in favour of auxin resulting in formation of female flowers. These results are conformity with the finding of Chaudhari and Patel (2010) [5] in mango and Tambe *et al.* (2015) [21] in chilli. Significantly maximum number of female flower (22.95) recorded in the treatment combination of m₂c₃ which was at par with m₁c₃, m₂c₂ and m₁c₂. Significantly minimum number of female flower (17.53) was recorded in the treatment combination of m₀c₀. It's due to interaction of mulch and cow urine application in which mulch raised temperature and increased number of flower and cow urine application which determined by balance of auxin and gibberellic acid balance in favour of auxin resulting in formation of female flowers. These results are supported by the findings of Nayak *et al.*, (2017) [13] in pointed gourd and Bhogi *et al.*, (2023) [3] and Samphire *et al.*, (2023) [17] in cucumber.

Days taken for fruit set to edible maturity

Significantly minimum days taken to fruit set to edible maturity (3.76) per plant was observed with treatment m₂ (silver plastic mulch) which was at par with (3.86) m₁ (black plastic mulch). It may be attributed to better soil hydrothermal regimes, better soil moisture conservation, which consequence minimize days taken to maturity. The results obtained are consistent to Faris and Orozco (1994) [9] in cucumber and Rathava *et al.* (2015) [16] in watermelon.

Percent fruit set

Significantly maximum percent fruit set (60.67%) per plant was observed with treatment m₂ (silver plastic mulch) which was at par with (59.28%) m₁ (black plastic mulch). Higher fruit set might have been influenced by favorable soil temperature, moisture conditions and pest- disease control as influenced by silver plastic mulch. The present finding was in accordance with Hanna (2000) [10] in cucumber.

Sex ratio

Sex ratio was not significantly influenced in various mulches, application of cow urine and its interaction.

Table 1: Effect of different plastic mulches and application of cow urine on growth and flowering of cucumber

Treatments	Vine length (cm)			Number of branches at harvest	Days taken for first male flower appearance	Days taken for first female flower appearance	Number of male flowers	Number of female flower	Days taken to fruit set to edible maturity	Percent fruit set (%)	Sex ratio
	At 45 DAS	At 60 DAS	At harvest								
Mulches (M)											
m ₀	57.97	129.74	194.35	8.63	41.05	48.64	142.85	18.68	4.15	52.57	7.69
m ₁	74.33	158.30	237.37	14.63	35.75	42.72	156.53	20.59	3.86	59.28	7.68
m ₂	77.30	163.77	246.33	15.11	35.25	42.54	160.52	21.54	3.76	60.67	7.48
m ₃	67.31	145.38	217.99	13.33	38.86	45.95	146.48	19.65	4.04	55.22	7.49
S.Em. ±	1.53	3.17	4.44	0.29	0.83	0.92	3.29	0.54	0.08	2.19	0.31
C. D. at 5%	5.29	10.97	15.26	1.02	2.88	3.20	11.40	1.88	0.27	7.61	NS
C. V. %	7.65	7.36	6.82	7.89	7.64	7.13	7.53	9.38	6.85	13.82	14.25
Cow urine (C)											
c ₀	63.69	137.21	205.48	11.69	38.88	46.39	140.23	18.32	4.08	57.42	7.72
c ₁	65.82	144.38	216.49	12.44	38.02	45.10	144.62	19.92	3.98	56.48	7.31
c ₂	72.49	155.63	233.94	13.46	37.28	44.66	158.03	20.90	3.91	58.23	7.62
c ₃	74.91	159.97	240.13	14.11	36.72	43.70	163.50	21.32	3.83	58.26	7.64

S.Em. ±	1.28	2.63	3.93	0.29	0.67	0.78	2.70	0.43	0.07	1.76	0.22
C. D. at 5%	3.78	7.68	11.48	0.67	NS	NS	7.87	1.26	NS	NS	NS
Interaction											
S.Em. ±	2.55	5.26	7.86	0.46	1.34	1.56	5.39	0.86	0.14	3.53	0.44
C. D. at 5%	7.45	15.36	22.95	1.33	NS	NS	15.74	2.52	NS	NS	NS
C. V. %	6.39	6.11	6.08	6.11	6.17	6.01	6.16	7.43	6.17	11.10	10.14

Table 2: Interaction effect of plastic mulches and cow urine on growth and flowering

Treatments	Vine length (cm)			Number of branches at harvest	Number of male flower	Number of female flower
	At 45 DAS	At 60 DAS	At harvest			
m ₀ c ₀	51.36	116.51	173.77	8.21	139.34	17.53
m ₀ c ₁	54.63	123.05	184.58	8.53	142.43	18.88
m ₀ c ₂	61.97	137.73	206.59	8.84	144.57	18.99
m ₀ c ₃	63.93	141.66	212.49	8.94	145.06	19.32
m ₁ c ₀	65.75	140.91	211.37	13.31	139.91	16.37
m ₁ c ₁	68.38	147.82	221.74	13.20	147.86	20.29
m ₁ c ₂	79.67	168.06	252.09	15.44	165.06	22.84
m ₁ c ₃	83.50	176.40	264.28	16.57	173.29	22.87
m ₂ c ₀	71.14	148.27	222.41	13.86	141.24	20.14
m ₂ c ₁	71.53	159.05	238.25	14.41	145.51	20.22
m ₂ c ₂	79.58	166.50	251.75	15.57	176.78	22.84
m ₂ c ₃	86.97	181.26	272.89	16.59	178.54	22.95
m ₃ c ₀	66.52	143.15	214.38	11.37	140.42	19.24
m ₃ c ₁	68.76	147.60	221.41	13.64	142.68	20.29
m ₃ c ₂	68.73	150.21	225.31	13.98	145.70	18.93
m ₃ c ₃	65.23	140.56	210.84	14.33	157.12	20.13
S.Em. ±	2.55	5.26	7.86	0.46	5.39	0.86
C. D. at 5%	7.45	15.36	22.95	1.33	15.74	2.52
C. V. %	6.39	6.11	6.08	6.11	6.16	7.43

Conclusion

It is concluded from the investigation that to obtained higher growth and quality, summer cucumber should be mulched with silver plastic and applied 15% of cow urine at 20, 30 and 50 days after sowing.

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