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Response of mulching on cucurbitaceae crops: A review

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Abstract

Mulching is a basic covering layer which protects plant from various extreme conditions. Mulching help to create micro environment around the plant so that it can get require nutrients. In family Cucurbitaceae mulching is the best method to increase the production. The most important use of mulches is conserve soil moisture, stopping soil from erosion, controlling the weeds, prevention of soil from becoming compact, maintaining in the soil moisture because of this benefit most of the modern farmers used to apply mulches in their field. Soil health, along with its physical, chemical and biological properties, can be mulched to create an ideal habitat for soil worms and other beneficial soil micro-organisms to survive. Weed seedlings cannot survive in a mulched environment to avoid the use of chemical compounds. 50% of plastic mulch is mostly used since 1991 and they are known under a category of protected cultivation. There are two types of mulches organic and inorganic mulches or synthetic mulch. In this review we can know different mulches effect on the Cucurbitaceae family.

Keywords: mulching, organic, inorganic, Cucurbitaceae

Introduction

Cucurbits belong to tropical origin and their genera distributed in Africa, tropical America, and Southeast Asia. Some of the cucurbits are humid tolerance and some are tolerant to cool temperature. They belong to family Cucurbitaceae, which consists of 120 genera along more than 800 species. Most of the cucurbits grow in warm temperature cultivated in large scale and transported to layer distance due to high demand. Some of the vegetables like cucumber, summer squash, pumpkin, watermelon, bottle gourd etc., belong to Cucurbitaceae family. India occupies 2nd position china in the production of squashes, pumpkins and gourds with a production 14.78%. Cucurbits mainly have vines, some are woody, some contain shrub. They have white or yellow flowers but pepo type fruit the thickness of artificial mulch should be 15-30 microns for the vegetable crop which is mostly preferable. Organic mulches such as newspaper, rice straws, leaves, composts, grass clippings etc. help in soil decomposition increase soil fertility (Dickerson 2000) [9]. Mulching checks soil erosion, water evaporations, weed growth to some extent. When moisture retention is high, they not only increase physical condition but also other properties of soil which increases the yield and various growth parameters of plant. To attain the maximum gain from the mulch should be applied immediately after the mulch is applied crop germination, at a minimum dose of 5 tons per hectare. There could be mulch that takes several forms like living ground cover of plants, loose organic and inorganic matter particles spread over the soil or sheets laid on the soil surface with artificial or natural materials, to form mulch, plant residues from previous crops may also be used.

Effect of inorganic mulches

Hallidri *et al.*, (2001) [14] investigated the effect of different mulches on yield, growth and quality of cucumber variety Shekulli f1 hybrid when grown under greenhouse conditions with different mulching material. The findings revealed that black film mulch gave a greater number of leaves and quality as compared to silver film and transparent film. No difference was recorded in yield in all the mulches which were used during experimentation. Gebologlu and Saglam (2002) [11] examined that effect of different mulches used in cucumber crop. The mulching materials like transparent polyethylene, black polyethylene and straw increased the yield in pickling cucumber and fruit yield. Transparent polyethylene mulching material along with 20cm spacing within row combination gave better yield as compare to other mulches.

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Alemayehu-Ambaye and Joseph (2002) [3] conducted an experiment on effect of plastic mulch on growth and yield of watermelon and cowpea when are grown in rainfed condition of Western Sudan. Plastic mulch increases the plant height, fruit weight, fruit number, in watermelon where as in cow pea it increased number of pods, grain yield and 100 seed weight. Their findings concluded that plastic mulch increased the yield and vegetative growth in watermelon and cow pea.

Fonseca *et al.*, (2003) [10] conducted experiment on effect of color polyethylene as soil covers and grafting effect on cucumber flowering and yield. In this experiment mulch materials like black, white on black, green polyethylene along with one control treatment. The findings concluded that black polythene mulch in cucumber increase yield by 21% along with amount of fruits per plant as compare with the no mulch condition.

Siwek and Lipowiecka (2005) [32] investigated the effect of different types of mulches on the yield of cucumber. Different mulches colors like clear, black and white polyethylene film during experimentation. The highest yield was recorded in clear polyethylene mulch as compare to other mulches.

Gordon *et al.*, (2008) [12] studied that effect of row covers, plastic mulches in the production of summer squash. Colored mulch like black, red, blue plastic were recorded with high soil temperature when they were used in summer squash whereas the use of silver mulch was recorded with the lowest soil temperature than other dark colored mulch.

Ibarra-Jimenez *et al.*, (2008) [16] examined that effect of colored mulches on photosynthesis, soil temperature yield in cucumber. In this experiment mulches like white on black, Blue, black, Black embosed, silver on black, red, and brown. Increase in yield in cucumber due to mulches as compare to other mulches finally they concluded that specific colour plastic mulch should be used by farmers which can be affective in their location

Abdrabbo *et al.*, (2009) [1] investigated that effect of mulches and irrigation on cucumber yield and growth parameters. Colour mulches like transparent, red, green, blue, yellow, black, and control along with different irrigation level 0.60, 0.80, 1.00, and 1.20 by using drip irrigation method. Their findings concluded that transparent mulch along with 0.80 (ET) increase the plant growth and yield.

Melek and Atilla (2009) [22] conducted an experiment to study the effect of different mulch material on plant growth, quality parameters and yield of melon (*Cucumis Melo* L. There findings concluded that average marketable yields are higher in clear plastic mulch 25-28% in high altitude environmental conditions.). From experiment, it was concluded that clear mulch gave high soil temperature, average weight of melon, highest marketable yield

Tomasz *et al.*, (2010) [34] carried out an experiment to study the effect of black polyethylene mulch on yield of cucumber. It was concluded that black polythene has higher irrigation efficiency than non-mulched soils. There was no difference in total yield of cucumber which was recorded equal in both mulch and non-mulch condition.

Mahmood *et al.*, (2011) examined that effect of mulching on vegetable production in tunnel farming. Under the investigation, cucumber and bitter gourd production was observed with mulch and non-mulch conditions. The findings revealed that average yield of bitter gourd was highest in mulch condition and the production was increased by 23.7% due to better bed mulching practice and it helped to decrease the weeds and conserve soil moisture due to which plants performed well under tunnel farming.

Bhatt *et al.*, (2011) [6] carried out the experiment to study the effect of different mulches on characters, yield, and production economics of summer squash. Different mulches like black plastic, clear plastic, dry leaves, pine needles, green twigs of forest litter, fodder crop and farm yard manure were used during experimentation. Black plastic mulch recorded with maximum plant height, plant spread, root length, number of leaves, and yield.

Ajay *et al.*, (2012) observed that white plastic mulch reflects twice amount of sunlight than black plastic mulch when it used as mulch in cucumber. The findings concluded that white plastic mulch help to keep soil temperature lower as compare to black plastic mulch and it is mostly preferred tunnel as better mulch than black due increase in yield factor.

Luqman *et al.*, (2013) [19] studied that integrated weed control in bitter gourd under the Agro-ecological conditions of Peshawar. Different forms of mulch (Rumex crispus, Silybum marianum, newspapers and sawdust) and herbicide, Stomp 330 EC (pendimethalin) as a pre-emergence product. They concluded that the efficiency of mulching treatments was substantially more successful than weed check plots.

Parmar *et al.*, (2013) [27] examined the impact of mulching material on the yield, growth and quality of watermelon (*Citrullus lanatus* thunb) in cv. Kiran. The outcomes showed that various forms of mulching content had a major effect on parameters like the number of branches per vine, the length of the vine and the number of nodes per vine over control. Silver on black polyethylene mulch recorded high yield and better-quality characters whereas low yield is recorded in no mulch condition.

Ram *et al.*, (2013) [28] studied that the impact of mulching and training on growth, yield parameter and the economy of pointed gourd. They found that the use of organic mulches appeared to be helpful to both characters. They also recorded that the maximum length of the vine, number of branches, was developed among the organic mulches of paddy straw. Number of nodes, average fruit weight and yield per plant followed by typha excluding average fruit weight where water is present in hyacinth and mustard were next to straw paddy. They suggested that the use of organic mulches was seen to be helpful in increasing the yield of pointed gourd fruits compared to control

Mahadeen (2014) [5] studied the effect of polyethylene black plastic mulch on growth and yield of summer squash and okra crops under rainfed condition in semi-arid regions of Jordan. It was concluded that mulched plots recorded with high moisture content and positive effect on yield. The increase in fruit weight and yield in both crops of okra and summer squash was also recorded. Mulched plots produced both fresh and dry weights of both crops.

Mutetwa and Mtaita (2014) [25] studied the effect of different color mulches on cucumber production. The findings revealed that the colored plastic mulch reduced weed population and increased production. Silvery grey colored mulch found to be suitable for producing superior branches, fruits, fruit size, and good yield in cucumber as compare to other mulches like wheat straw and blue colored mulch.

Atif *et al.*, (2014) [5] examined that water use efficiency in agriculture is mostly increased by mulching process. This technique was implemented in summer vegetables production rainfed condition. Plots are covered with black plastic mulch in squash and okra vegetable increased fruit yield, weight and fruit number.

Aniekwe and Anike (2015) [4] studied the impact of various mulching materials and plant densities on the environment,

the growth and yield of cucumber. Its results revealed that the rice hull mulch had the largest vine length (145.5 cm), leaf area (184.63 cm²), fruit weight (1.27 kg), fruit length (62.7 cm) and fruit diameter (9.43 cm) than the control and increase the average daily soil temperature varied from 28.1 to 27.4 degree centigrade while clear plastic mulch has the largest number of vines (5.2), the number of leaves (32.5), the number of fruits (7.98) and the biggest change on average daily soil temperature (28.8c). For small hold farming, mulching along with plant spacing have efficient production and management of cucumber

Sageer khan *et al.*, (2015) [31] observed effect of different mulching material on growth and yield of Sponge gourd. It was observed that black polyethylene mulch increased the yield, length, flowering, vine spread, fruit length, fruit diameter, fruits per plant and yield when mulch was used in sponge gourd (Pusa Chikni variety). No mulch treatment gave low yield and poor-quality fruits.

Haapala *et al.*, (2015) [13] examined that effect of paper mulched and biodegradable plastic mulches on the yield of cucumber. Paper mulch: brown kraft paper with underside coated and both side coated with black biodegradable film was used. It revealed that there was no difference in the yield between different types of mulches. The weed population in mulch was much less than in plots covered with mulch as compared to uncovered plot. Dark colored paper mulch was comparable to biodegradable film in terms of yield and quality parameters.

Roudan and Abbosi (2015) [30] studied the effect of mulch in cucumber basis of number of leaves, average yield of plant, number of fruits per plant, plant height, plant weight and total yield. The results showed that white mulch increased the earliness in cucumber and highest yield as compare to other mulches.

Soleymani *et al.*, (2015) [33] studied the impact to determine the effect of mulches and planting method in cucumber crop variety Super Dominus. Mulches like clear and black polyethylene mulch, hydro flume mulch, and no mulch (control). The effect of planting method and mulches increased the no. of days to flower, plant length, earliness and harvest. The results showed that early yield and yield per plant is highest in clear mulch (186.42) and black mulch (183.12g/plant). Total yield is highest in black mulch (1671.75g) per plant and Clear mulch most helpful in controlling broomrape.

Ram *et al.*, (2015) conducted an experiment on effect of seven different mulches and soil properties in summer squash. They concluded that mulching not only regulates the soil temperature, it also affects the chemical properties of soil as well as growth and development of summer squash.

Homez and Arouiee (2016) [15] conducted an experiment on the plant cucumber in desert Najaf. The findings stated that highest heat accumulation was recorded in black polythene (1705) along with other mulches like transparent (1583), rice residues (1428) and in control (1194). The highest number of fruits and yield was recorded in black polythene mulch.

Torres oliver *et al.*, (2016) [35] investigated on cucumber to determine its growth and yield by using various colors of plastic mulches like yellow, red, white on black plastic under shade house. Mulch color mostly affected leaf phosphorus, magnesium, nitrogen, calcium. The findings compared both side mulch in shade house condition and mulch in open field conditions. The best result was recorded under shade house mulches which recorded high yield and quality of cucumber.

Franczuk *et al.*, (2016) [17] investigated the impact of different transplantation dates (May 15, May 25, and June 4) and date of removal of polypropylene fiber (4 and 8 weeks after transplantation and no cover used in control) on the growth, production and yield of melon (*Cucumis melo* L.). Plants planted on May 15 were longer by 22% and 56%, weighed more by 39% and 76%, and their leaf area index (LAI) was higher by 24% and 117% compared to plants planted on May 24 and June 4, respectively. The covering of plants planted at each date contributed to an increase in yield and in the share of marketable fruit yield in the total yield.

Mohammed *et al.*, (2017) [24] conducted an experiment on performance of Bottle Gourd (*Lagenaria siceraria*) in the greenhouse. The purpose of this research was to investigate the effects of polyethylene mulching (black and white) and Mycorrhizae inoculation on plant growth, fruit production, seed yield and seed oil content. By using polyethylene mulching increased soil temperature and soil moisture content relative to bare soil moisture content. The results revealed that a great improvement in vegetative growth in the inoculated treatments compared with control and the black polyethylene mulch was more successful than the white mulch.

Bobby *et al.*, (2017) [7] examined that different inorganic mulches like black-black, black-silver, black-white and organic mulches like paddy straw, paddy husk, ground nut shells along with pre-emergence herbicide (pendimethalin @ 1.0kg a.i/ha-1). The results revealed that black -black polythene mulch controlled the highest weed density and its dry weight at 30, 60, 80 days after sowing the crop. Whereas, black -black polythene mulch along with paddy straw mulch shows lowest weed control efficiency (55.93%, 56.02%, 56.88%) at 30, 60, 80 days. Weed index was highest at pre-emergence herbicide (pendimethalin @ 1.0kg a.i/ha-1) and less weed index noticed in black silver polythene mulch.

Kumar and Sharma (2018) [18] conducted an experiment in which effect of mulching on growth, quality and yield parameters in different squash varieties. They laid out 20 different treatments along with five different mulches like black plastic mulch, blue plastic mulch, transparent mulch, rice straw mulch, and control and four varieties of summer squash like Arpit, Surya, Pratap, and Desi. This study revealed that black plastic mulch along variety Surya gave highest yield and shown good crop improvement.

Akhter *et al.*, (2018) [2] carried out an experiment to horticulture farm of Sher-e-Bangla Agriculture University to determine the effects of mulches and phosphorous on growth and yield of squash (*Cucurbita pepo*). Black polythene with 90kg P₂O₅ combination found to increase fruit yield and fruit weight.

Conclusion

Cucurbits are one of the most important crops in the vegetable crop which are mostly cultivated in summer season. Most of the cucurbits used as vegetable at immature stage in raw or cooked form. For the better yield of cucurbits, we can use mulch for early yield, by using different organic and inorganic mulches it is not only increase the yield but also prevents the moisture loss, weed control. Marginal farmers mostly can use mulches to increase the production and yield of particular crop.

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