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EFFECT OF PLASTIC MULCH AND ROW COVER IN VEGETABLE CROPS

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Abstract

Protected agriculture is a technique used to modify a plant's natural environment in order to optimize plant growth. Such techniques are often used to protect plants from frost in order to extend the growing season of a crop. Through earlier crop production, growers are able to capitalize on early markets and higher prices. Many leading vegetables are being grown with the same technique. Plastic mulch in combination with row covers has shown in increased yield of several horticultural crops by improving moisture uniformity in the soil and raising air and soil temperatures, thus creating a favorable microclimate for the growth of vegetable crops. For greatest efficiency and economy, mulch and/or row cover must be employed as a part of total production system.

Key words: Microclimate, Mulch, Protected agriculture and Row cover

Introduction:

Row cover

As early as the 1940s, row covers were investigated for use in vegetable production, commercial use expanded during the late 1950s and early 1960s. Row covers, which have been used predominantly in vegetable production, are flexible sheets of translucent materials such as extruded polyethylene or spun bonded polypropylene that cover one or more rows of a field-grown crop in order to enhance crop growth and production by increasing both air and soil temperatures and reducing wind damage. Row covers offer an excellent method of excluding vectors of plant pathogenic viruses and significantly, increasing yields of crops relative to traditional growing methods. Row cover is used to protect plants from frost and wind with moisture retention and also acts as a mechanical barrier for insects that improves yield and quality.But heavy wind velocity can cause serious damage to it and the heavier materials are more expensive which requires quite significant labour costs.

Plastic covered trenches	Floating row cover	Hoop supported row cover or low tunnel
Allow for early seedling and plant growth.	Cut wind velocity on tender plants and screen out some insects.	Reduce the abrasive damage to the plant.
Polyethylene is stretched across a trench about 7 inches deep. As temperatures rises, periodic holes are made.	Lay directly over crops.	Supported by wire hoops.
Plastic is removed when plants come in contact with the bottom of the row cover.	For insect pollinated crops, covers must be removed for pollination.	Hoops are made from 9–10gauge galvanized wire 48–60 inches long, spaced 4–5 feet apart in the row.

Plastic mulch

Plastic mulch was first used for vegetable production in the early 1950s, but commercial use was started by the late 1960s. Several types of plastic mulch are available for covering the soil. Clear, black and wavelength selective plastics are most commonly used. Plastic mulch of variable colors or specific characteristic is also available. They include; black polythene mulch: most predominating coloured mulch, clear or transparent plastic mulch: soil solarization, white polythene mulch: establishing crops under hot summer conditions, silver polythene mulch: repel aphids and delays the virus symptoms, yellow polythene mulch: reflects different radiation patterns into the canopy and red polythene mulch: change the ratio of R: FR light.Plastic mulch preserves the soil moisture and controls weed growth which improves soil micro climate, microbial population. It is helpful in early maturity and improves production that improves the quality of fruit. It also reduces fertilizer leaching. But there is a chance of environmental pollution, difficulties in machinery movement and application of top dress fertilizers which can cause burning or scorching of young plants.

Review of Literature:

Plastic mulch

Parmar *et al.* (2013) observed maximum number of branches per vine (14.90), vine length at harvest (224.97 cm), number of nodes (59.58), length of fruit (37.45 cm), number of fruits per vine (3.23), fruit weight (3.61 kg), fruit yield (35.37 t/ha), reducing sugar (1.80 %), non-reducing sugar (3.67 %) and total sugar (5.47 %) with the application of silver on black mulch in watermelon cv. Kiran.

Rathva*et al.* (2015) recorded maximum number of fruits per vine (3.17)with application of black plastic mulchwhereas, length (41.83 cm) and width (40.49 cm) of fruit, average fruit weight (5.26 kg) and yield of fruits per vine (16.21 kg) found maximum with the use of silver plastic mulch in watermelon cv. Asahi Yomato.

Kumari *et al.* (2016) reported maximum total yield with the use of black plastic mulch in tomato cv. All Rounder.

Abraham *et al.* (2017) recorded maximum fruit length (25.95 cm), fruit girth (24.19 cm), fruit weight (255.94 g), number of fruits per plant (24.68), number of harvest (10.74) and marketable yield (22.85 t/ha) with the application of silver-black plastic mulch in bitter gourd cv. Preethi.

Rao *et al.* (2017) observed maximum number of lateral branches (12.1), length of fruits (35.9 cm), width of fruits (60 cm), fruit weight (5.2 kg) and yield (35.57 t/ha) with the application of silver mulch whereas maximum number of fruits found in silver mulch as well as with black mulch in watermelon cv. Sugar Baby.

Singh *et al.* (2017) reported maximum number of nodes per plant (39.5), plant height (245.8 cm), number of fruits per plant (40.4), fruit weight (60.2 g), yield (10.9 kg/m^2), harvest duration (85.6 days) with the application of double shaded plastic mulch whereas days to first harvest (83.2) found minimum in black colour plastic mulch in tomato cv. Palam Tomato Hybrid 1.

Dadheech*et al*. (2018) recorded maximum number of branches per vine (14.90), vine length at harvest (223.97 cm), number of nodes (58.58), fruit length (36.45 cm), number of fruits per vine (3.23), fruit weight (3.61 kg), fruit yield (34.37 t/ha), fruit pulp weight (2418.67 g), reducing sugar (1.80 %), non reducing sugar (3.67 %), total sugar (5.47) and minimum acidity (0.36 %) with the application of silver mulch in watermelon cv. Sugar Baby.

Kumar and Sharma (2018) observed maximum plant height (138.22 cm), number of leaves per plant (100.42), number of fruits per plant (37.36), average fruit weight (95.82 g), yield per plant (3.58 kg), fruit yield (32.26 t/ha) and number of harvest (17.58), whereas minimum days taken for first harvesting (41.50) with the application of black plastic mulch in summer squash cv. Surya.

Row cover

Hernandez *et al.* (2004) recorded maximum biomass (709.6 g/m^2), total yield (13.8 kg/m^2) and commercial yield (11.9 kg/m^2) whereas lowest tip burn affected plants (1.0 ± 0.5 %), bolted plants (1.2 ± 0.5 %), non-heading plants (4.6 ± 1.2 %) and deformed heads (4.6 ± 1.24 %) were found with the use of row cover in chinese cabbage cv. Nagaoka 50.

Kalisz *et al*. (2014) observed maximum height (24.1 cm), leaf number (17.3), leaf area (392.3 cm^2), leaf length (31.3 cm) and leaf width (21.1 cm), total yield (90.20 t/ha), total number of heads per hactare (71429) while marketable yield (88.05 t/ha) and number of marketable heads per ha (68452) were recorded with the application of row cover in chinese cabbage cv. Optiko F_1.

Plastic mulch and row cover

Ibarra *et al.* (2001) reported maximum plant biomass (22.95 g), total leaf area (2284 cm^2), relative growth rate (0.297 g/g/day), net assimilation rate (17.4 g/m^2/day), total marketable yield (78.572 t/ha) and total yield (87.102 t/ha) under plants over black plastic mulch with row cover removed 20 days after seedling treatment in muskmelon cv. Crusier.

Ibarra *et al.* (2004) observed maximum total yield (125.01 t/ha) with the application of black polythene mulch film combine with row cover of white polythene in cucumber cv. Sprint 440.

Ibarra *et al.* (2005) recorded maximum marketable yield (58.49 t/ha) with the application of black polythene mulch with white cover of perforated polythene whereas total yield (73.18 t/ha) with the application of clear polythene plastic mulch in watermelon cv. Jubilee.

Gordon *et al.* (2010) reported maximum total yield with black mulch colour (15,226 Ib/acre) while with row cover (12,108 Ib/acre) in okra cv. Clemson Spineless**.**

Nair and Havlovic (2013) observed maximum leaf number per plant (22), leaf area (4944 cm^2) and yield (7.7 kg/30 plants) with the application of white mulch combine with row cover in lettuce cv. Caliente.

Nimbalkar (2014) reported maximum number of leaves per plant (43.85), fresh weight of vine (4.47 kg/plant), fresh weight of fruit (980.60 g), number of fruits per vine (10.75), number of harvest (12.52), fruit yield per plant (9.17 kg) whereas minimum days to maturity (41.57) with the application of row cover combine with clear polythene mulch in summer squash cv. Geum Vit and he also recorded maximum number of leaves per plant (447), number of harvest (23.17), vine length (457.14 cm), fruit yield per plant (1.99 kg) and vitamin A content (121.22 IU/100g) with the application of row cover combine with black polyethylene film mulchin bitter gourd cv. ArkaHarit.

Conclusion

Plastic mulch in combination with row covers has been shown to increase yield of several horticultural crops by improving moisture uniformity in the soil and raising air and soil temperatures, thus creating a favorable microclimate for the growth of some vegetable crops. For greatest efficiency and economy, mulch and row cover must be employed as a part of total production system. Black plastic mulch increased the growth and yield of summer squash, tomato, whereas, use of double shaded plastic mulch also enhanced the growth and yield in tomato**.** Silver plastic mulch increased the growth, yield and quality of watermelon and bitter gourd. Use of row cover enhanced growth and yield of chinese cabbage and also minimized the physiological disorder. Black plastic mulch with row cover increased growth and yield of water melon,

musk melon, cucumber, okra and bitter gourd**.** Clear plastic mulch with row cover increased growth and yield of summer squash**.** White plastic mulch with row cover increased growth and yield of lettuce.

Future thrust

There is necessity to identify the crops which are appropriate for the plastic mulch and row cover system. They should also get consciousness about the benefits of using it by the extension programmes. The Government should provide funding for its installation which ultimately leads to the doubling of farmer's income by increasing the yield and quality of the crop.

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