Use of plastic mulch on cucumber
(Cucumis sativus) production under Sudan conditions.

by

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INTRODUCTION

The word 'mulch' is defined as the material (organic or
inorganic) spread on the soil surface to protect the plant and
modify the environmental conditions in which the plant is growing
with the objective of achieving one or more of the following:

Reduction of evaporation, increasing soil temperature,
control of weeds earlier an, higher crop yields and
maintenance of clean products.

Historically, mulching with a layer of dead vegetable waste
material has been prevalent for a long time in many parts of the
world. Nowadays, there is a shift towards the use of plastic
mulches in many countries especially by vegetable and strawberry
growers in the United States and many European countries. Little
is known, however, about its use in the Sudan.

In this paper the effects of plastic mulches on soil
moisture, soil temperature and cucumber growth and yield under
Sudan conditions are discussed.
MATERIALS AND METHODS

On 24th November 1971, cucumber seeds cv. 'Alpha Green' were sown in 6 plots (3 x 4 metres each) in the Demonstration Farm, Faculty of Agriculture, Shampat. Seeds were sown 50 cm apart on both sides of 'Mastaba' which was 125 cm wide. Four to five seeds were sown per hole. Seedlings were later thinned to a single plant per hole thus leaving 32 plants in each plot.

When seedlings were well established (cotyledons were fully expanded), two plots were covered with transparent plastic film (0.9 mm thick), another two with black plastic of the same thickness, whereas the remaining two were left uncovered as control. Holes were made on the plastic films through which the seedlings were carefully manured out to have their cotyledons on top of the plastic mulch. The plots were irrigated at intervals of 7 - 10 days and care was taken to apply equal amounts of water to each plot.

Several measurements were made including soil moisture content at depths of 0-3, 3-6, 6-12 and 12-15 inches using the Standard Gravimetric Method. Soil temperature was recorded at a depth of 3 inches using soil thermometers. Both measurements of soil moisture and soil temperature were made, in each plot, on the day before irrigation was applied.

Records on the plants included the date of appearance of the first female flower, total number of flowers, ratio of female to male flowers, and the number of fruits per plant. On 21st February 1972, all fruits were collected and their fresh and oven-dry weights were recorded.

RESULTS AND DISCUSSION

Figure 1 shows that under both black and transparent mulches the soil moisture was greatly retained and that it was significantly higher than that of the control. The soil moisture content at 3 inches soil depth was increased 47% and 50% by the transparent and black mulches, respectively. This is in line with the findings of Ratan Lal (1974). Great differences in conservation of soil moisture were noticed till the 12 inch depth, but at 24 inch the differences were not significant. Although the moisture content under the black plastic mulch was always higher

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* Mastaba is a local Sudanese term referring to a ridge not less than 50 cm wide.
than that of the transparent, the differences did not reach a significant level at any soil depth.

Mean soil temperature was higher under the two plastic mulches than the control by an average of 5°C. This may be due to the following factors acting singly or in combination:

a) Plastic mulches absorbed comparatively more of the incoming radiation and transmitted a considerable part of it to the soil under them.

b) With mulching there was probably more biological activity thus giving more heat.

c) The mulches reduced evaporation which is a factor contributing to cooling. A similar explanation was given by Clarkson (1957) and Frenz and Munz (1967).

The mulching treatment has influenced the time for the production of the first female flower which is an indicative for earliness. It was 39, 33 and 30 days after sowing under the control, black and transparent mulches, respectively. Ming and Matzkevitch (1944) stated that high soil humidity hastened the onset of pistillate flowers, while the low soil humidity accelerated the appearance of staminate flowers.

The more available soil water and optimum soil temperatures under the mulches produced a high number of flowers per plant (Fig. 2) and high sex expression (Fig. 7) than the control.

The significantly greater number of fruits per plant produced by the mulched plants in comparison with those of the control was due to the production of higher total number of flowers accompanied with high percentage of pistillate flowers (Fig. 4). Scott (1933) reported that within a particular cucurbit cultivar there was a correlation between the number of flowers and the number of fruits produced.

Figure 5 indicates the fruit fresh weight per plant, which was increased by 69.5% and 36.5% by black and transparent mulches, respectively. The oven-dry weights followed somewhat a similar trend.

On removal of the mulches from the plots at the end of the experiment, it was noticed that the black mulch effectively suppressed some weed growth. This may be due to its insulating effect i.e. reduction of light. Such an effect on weed control may be of great economic importance under the Sudan conditions where the weeds cause much trouble and their control is an expensive operation especially to vegetable growers and the subject seems worthy of further study.
SUMMARY

Plots under the mulches reserved more moisture than the control. The differences at 3 inches soil depth were 47% and 50% for the transparent and the black mulches, respectively. Both mulches also increased the soil temperature by an average of about 5°C.

The mulches produced earlier pistillate flower set (6 – 9 days earlier), increased the number of flowers and fruits per plant.

The black mulch effectively suppressed some weed growth.

REFERENCES


Figure 1. EFFECT OF MULCH ON SOIL MOISTURE CONTENT
Figure 2: EFFECT OF MULCH ON THE NUMBER OF FLOWERS PER PLANT
Figure 3. EFFECT OF MULCH ON SEX EXPRESSION
Figure 4. EFFECT OF MULCH ON THE NUMBER OF FRUITS PER PLANT
Figure 5: EFFECT OF MULCH ON FRUIT FRESH WEIGHT PER PLANT