Khulna University Studies 4(1): 623-625

# EFFECT OF MULCHES ON THE YIELD OF SUNFLOWER IN COASTAL SALINE AREAS OF BANGLADESH

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KUS-02/03-290402

Manuscript received: April 29, 2002; Accepted: January 27, 2003

**Abstract:** A field experiment was carried out on slightly saline medium high land nearly level Bajoa soil series developed on Ganges tidal flood plain. Four different types of mulches viz. water hyacinth, rice straw, rice husk and polythene sheet were used in this experiment. Sunflower (*Helianthus annus* L.) variety "Kironi" was taken as an index crop and was cultivated during January-April, 2001. Rice straw and rice husk as mulch responded better production to sunflower and the yield was 2.03 and 2.02 t/ha. Whereas, the yield (1.77 t/h) was found in case of water hyacinth as mulch. Rice straw and rice husk preserved 29.2-44.4% moisture and decreased 39.6-42.3% soil salinity than that of fallow lands. By using different types of mulches, it was found that sunflower yield increased 6.9-14.5% than that of without mulch and the trend were rice straw> rice husk> fallow> polythene sheet> water hyacinth. Although polythene sheet preserves maximum soil moisture and possess minimum soil salinity but yield were even less than fallow lands. It happened, may be, due to increase in soil temperature and aeration problems of soil microbes. With the consideration of both soil moisture and soil salinity, better growth and yield of sunflower was performed using rice straw and rice husk as mulches.

**Key words:** Sunflower; yield; mulches; soil moisture; soil salinity; coastal area.

## Introduction

Sunflower (*Helianthus annus L.)* is one of the important oilseed crop grown worldwide. Application of irrigations resulted in increasing the dry matter accumulation in sunflower (Andhale and Kalbhor, 1980). Under the present state of limited water resources, efficient use of water needs no emphasis (Jambhale and thorat 1988). Mulches and antitranspirants are effective in reducing the evaporation and transpiration thereby maintaining the water balance without affecting the growth (Mungse and Bhapkar, 1982). The area is mostly under mono cropped practices with cropping intensity of 114% (SRDI, 1997). The factors which contribute significantly to the development of saline soils are: tidal flooding during wet season, direct inundation by saline or lateral movement of saline ground water and upward or lateral movement of saline ground water during the dry season (Karim *et al, 1990).* The farmers of these area are mostly dependent on low yield mono crop local rice varieties, sometimes dry land crops in rabi and kharif-1 season like mungbean, sesame, sweet gourd etc. for their staple food and other requirements. Keeping this view in mind the study was planned to evaluate the effect of mulches on the yield of sunflower. Thus, objectives of this study are: a) to observe the effect of different types of mulches on the yield of sunflower and b) to find out the adaptability of the exotic sunflower under different mulching condition.

## Materials and Methods

The experiment was conducted in Randomized Complete Block Design (RCBD) with three replications in medium high land, nearly level Bajoa soil series. Sunflower was cultivated with different types of mulches. Each block was consisted of five plots and individual plot size was 6m x 5m having 0.5m x 0.25m spacing each plot for draining. The adjacent blocks and neighboring plots were separated by 1.0m and 0.5m, at a distance row to row and plant to plant 50cm and 30cm respectively. All the plots were well covered just after sowing sunflower seed by different kinds of semi dry to dry mulches, they were water hyacinth ($T_1$), rice straw ($T_2$), fallow lands ($T_3$), rice husk ($T_4$), and polythene sheet ($T_5$). Sunflower variety "Kironi" was taken as an index crop and was sown in lines. On the basis of soil test value fertilizers were used as 116-35-9-5-0-0.5 kg/ha N-P-K-S-B-Zn, respectively. Full amount of TSP, MP, gypsum and zinc sulphate were incorporated during final land preparation. Urea were top-dressed in three equal installments at 15, 30, 45 days after sowing. Irrigation was given from deep tubewell having ECw 1.7 dS/m. Ayres & Westcot (1976) indicated in their guide lines that irrigation water with ECw of >3 mmhos/cm begins to affect the growth of soybeans under field condition. Intercultural operations such as rearrangement of the mulches,

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DOI:https://doi.org/10.53808/KUS.2002.4.1.0203- L

protect the lodging by putting bamboo sticks etc. were done duly. Soil samples were collected from 0-15cm, 15-30cm and 30-60cm at 10 days intervals for determining soil salinity and 0-10cm depth of soil for determining soil moisture (%). ECe of the soil samples were determined in 1:1 soil water extract by using specific factor (Islam *et al,* 1993). Soil moisture was determined by oven dry method (USDA, 1963). Soil pH was determined from 1: 2.5 soil water extract. Soil texture was also determined by mechanical analysis. N was determined by Kjeldhal, P by revised Olsen, Bary & Cartz and organic carbon by dry combustion method. K was determined by flame photometer. S and B by calcium biphosphate extraction; Cu, Mn, and Zn were determined following DTPA extraction method. The experiment was laid out on 31. 01. 2001 and crop was harvested on 30.04.2001.

**Results and Discussion**

Before setting the experiment, soil samples were collected and analyzed in the regional laboratory of Soil Resource Development Institute (SRDI), Khulna. Table-1 revealed that N and P was found below critical level.

Table 1. Chemical properties of Bajoa soil (Topsoil) series.

| Soil properties | |
|---|---|
| $EC_e$ (dS/m) | 6.10 |
| pH | 7.20 |
| Organic matter (%) | 2.80 |
| N(ppm) | 11.1 |
| K(meq/100g soil) | 0.20 |
| P(ppm) | 3.30 |
| S(ppm) | 124.3 |
| B(ppm) | 0.82 |
| Mn(ppm) | 20.8 |
| Cu(ppm) | 13.4 |
| Zn(ppm) | 2.00 |

Rainfall, mean air temperature and topsoil salinity ranged from 0.0-64.0 mm, 18.4-29.9$^0$C and 4.2-5.8 dS/m respectively during the experimental period (SRDI, 2000). The salinity of shallow ground water was recorded 8.6 dS/m.

The rate of germination of exotic sunflower (Kironi) increased 28.6% with ground water (DTW) having $EC_w$ 1.7 dS/m than that of a non-irrigated condition. Table-2a, 2b revealed that maximum moisture preserved in polythene sheet and it was 45.2%. By using different types of mulches soil moisture preservation increased to 29.2-45.2% and topsoil salinity was decreased by 11.1-48.5% than that of fallow plots. In case of rice straw topsoil salinity was 2.62 dS/m but moisture preservation was 21.9%, and was 29.2% higher than fallow plots.

Table 2a. Effect of different types of mulches on moisture (%)

| Name of mulches | Moisture (%) |
|---|---|
| Water hyacinth ($T_1$) | 22.57 a |
| Rice straw ($T_2$) | 21.90 a |
| No mulch ($T_3$) | 16.95 b |
| Rice husk ($T_4$) | 24.48 a |
| Polythene sheet ($T_5$) | 24.61 a |
| $LSD_{0.05}$ | 2.33 |
| CV% | 13.99 |

Means followed by same letters in a column are not significantly different at 5% level by DMRT.

Table-2b. Effect of different types of mulches on soil salinity (dS/m)

| Name of mulches | Topsoil salinity |
|---|---|
| Water hyacinth ($T_1$) | 4.04 a |
| Rice straw ($T_2$) | 2.62 b |
| No mulch ($T_3$) | 4.54 a |
| Rice husk ($T_4$) | 2.74 b |
| Polythene sheet ($T_5$) | 2.34 b |
| $LSD_{0.05}$ | 1.24 |
| CV% | 32.81 |

Means followed by same letters in a column are not significantly different at 5% level by DMRT.

In case of rice husk moisture preservation was similar to polythene sheet and also topsoil salinity did possess similar result; soil salinity decreased to 39.7% in comparison to fallow lands. In case of moisture preservation by using different types of mulches, there was no significant difference at 5% level by DMRT except fallow lands. On the other hand, in case of soil salinity there was no significant difference in polythene sheet, rice straw and rice husk but significant difference showed with water hyacinth and controlled plot.

Table-3. Effect of different types of mulches on yield (t/ha) sunflower

| Name of mulches | *Yield (t/ha) |
|---|---|
| Rice straw | 2.03 |
| Rice husk | 2.02 |
| Controlled | 1.90 |
| Polythene sheet | 1.81 |
| Water hyacinth | 1.77 |
| $LSD_{0.05}$ | NS* |
| CV% | 15.69 |

*Not significant.

Table-3 revealed that sunflower "Kironi" responded to better yield with rice straw and was similar to rice husk. Yield increased to 6.9% in comparison to fallow lands and 56.2% than that of prescribed targeted yield. Rice straw and rice husk as a mulch responded better sunflower yield (t/ha) and was 2.03 and 2.02 and the lowest yield (1.77 t/ha) was found in case of water hyacinth as a mulch. Rice straw and rice husk preserved 29.2-44.4% moisture and decreased 39.6-42.3% soil salinity than that of fallow lands. It was found that by using different types of mulches, sunflower yield increases 6.9-14.5% than without mulch and trend was Rice straw> Rice husk> fallow> Polythene sheet> Water hyacinth. Although, polythene sheet preserved maximum soil moisture and posses minimum soil salinity but yield obtained even less than fallow lands, that happened may be due to increasing of soil temperature aeration problems etc.

## Conclusion

With the consideration of both soil moisture and soil salinity better growth and yield of sunflower was performed using rice straw and rice husk as mulches. Repeated and continuous study in the sequential years may help draw a conclusion on this management practice.

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