

EFFECT OF PADDY STRAW MULCHING ON THE SOIL MOISTURE AND YIELD OF MUSTARD [*Brassica juncea* (L.)]

*¹SONAWANE, ASHISH V.; ²BURBADE, RAJESH G. AND ³SENGAR, SANDIP H.

COLLEGE OF AGRICULTURAL ENGINEERING AND TECHNOLOGY
NAVSARI AGRICULTURAL UNIVERSITY
DEDIAPADA – 393 040, GUJARAT, INDIA

**EMAIL: ashish.iari@gmail.com*

¹Assistant Professor, Soil and Water Engineering Department, CAET, NAU, Dediapada, Gujarat

²Assistant Professor, Processing and Food Engineering Department, CAET, NAU, Dediapada, Gujarat

³Associate Professor, Renewable Energy Engineering Department, CAET, NAU, Dediapada, Gujarat

ABSTRACT

An experiment was conducted at Agricultural and Food Engineering Department, Indian Institute of Technology, Kharagpur during the rabi 2013-14 to study the effect of paddy straw mulching on the soil moisture and yield of mustard (var. Parvati). There were two treatments, in first treatment the crop was grown under rainfed condition with the paddy straw mulch (T₁) and in second treatment (T₂), the mustard was grown without mulch under rainfed condition. Results revealed that the mulch conserved on an average 36.8 per cent more soil moisture as compared to control plot. Plant height, thousand grain weight and yield were higher in T₁ (120 cm, 3.5 g and 475 kg/ha) compared to control, where the corresponding observations were 95 cm, 2.2 g and 320 kg/ha respectively. This study concluded that that paddy straw mulching not only conserved the moisture, but also increased the yield of mustard.

KEY WORDS: *Moisture, Mulching, Mustard, Rainfed*

INTRODUCTION

India is second largest rapeseed-mustard growing country after china. During the year 2013-14 rapeseed-mustard was cultivated on 6.6 million ha. of land and its contribution to total oil seed production was 24 per cent, which ranked second after soybean. It is also estimated that about 30 per cent of edible oil production of India is met by the rapeseed-mustard group of oilseeds (Kumar and Premi, 2003). All these statistics underlines the importance of rapeseed-mustard in the oilseed production in India. Despite of these facts, it is important to note that the productivity of rapeseed-mustard is very less compared to

that of other rapeseed-mustard producing countries. Countries like Germany (3368 kg/ha), France (3269 kg/ha), Australia (1426 kg/ha) and Canada (1400 kg/ha) have much higher productivity than India which is merely in the tune of 1180 kg/ha (Kumar and Premi, 2003). One of the important reasons of low productivity is that the major part of the mustard growing region is rainfed. Mostly it is grown in the rabi season during which rainfall is scare and usually came across the dried and hot periods during month of October. The yield reduces extensively if proper moisture is not available during the critical growth period of the crop. If the available moisture in the soil

profile, which builds up during the monsoon, is conserved *in-situ*, there could be increase in the yield. Tribal farmers of study region usually grow the mustard during the of rabi season and sow their seeds after cessation of monsoon season. The region is under rainfed ecosystem and facility of irrigation is rare. It was hypothesized that, if the moisture in the soil profile conserved *in-situ*, the yield of these tribal farmers would increase which leads to monitory benefits.

Mulching is one of the effective measures of *in-situ* soil moisture conservation (Kumar and Premi, 2003). Mulching not only increase the crop yield, but also improves plant growth and yield quality (Sharma and Sharma, 2003; Singh *et al.*, 2007). It was also observed that higher yield of crop could be achieved for early season crop (Gill *et al.*, 1996). This increase in yield is generally attributed to decrease in soil temperature and improved soil moisture regime (Lal, 1974). There are various types of inorganic mulches (plastic, paper, etc.) and organic mulches (straw, wood chips, etc.) which are widely used by farmers. Organic mulches have the advantage of low cost and easy availability over inorganic mulches. Kar and Kumar (2007) reported that higher potato yield and better crop growth for the plots with were mulched with straw. Similar, effect was observed for the watermelon by Johnson *et al.* (2004). It is, therefore, understood that the organic mulching like paddy straw which can be available easily after the harvest of the paddy, could be used to conserve the *in-situ* soil moisture and which in turns increase the yield.

With this view, the study was conducted to study the effect of paddy straw mulching on *in-situ* soil moisture and yield of mustard was studied.

MATERIALS AND METHODS

The experiment was carried out at the research farms of Indian Institute of Technology Kharagpur, West Bengal during the *rabi* 2013-14. The soil in the experimental site is mostly acidic in nature and the average soils are grouped under sandy loam textural class. The pH of the soil varies from 4.8 to 5.6. Water holding capacity of the soil is very low. The fertility status of the soil in the experimental site is also very low, which is one of the characteristics of soil in rainfed region. The climate of study area classified as sub-humid and sub-tropical types. It is characterized by hot and humid in summer (April and May), rainy during June to September, moderately hot and dry in autumn (October and November), cool and dry in winter (December and January) and moderate in spring in February and March. Average rainfall of the region is around 1440 mm. Mustard seeds (var. Parvati) were sown with row to row distance of 30 cm and plant to plant distance of 10 cm in first week of October during the experimental year. Two treatments were selected for the study with three replications each, using large plot technique. In first treatment (T_1), the crops were grown under rainfed condition with the paddy straw mulch, whereas in second treatment (T_2), the crops were grown without mulch under rainfed condition. Paddy straw mulch was spread in the rows soon after sowing of the seeds. Observations of soil moisture were recorded at 10, 25, 50, 75 and 90 DAS using time domain refractometry (TDR) for various incremental depths of 0-15 cm, 15-30 cm and 30-45 cm. Observations viz., plant height at maturity, primary branches, secondary branches, pods per plant, seeds per pod, thousand grain weight and yield were recorded.

RESULTS AND DISCUSSION

Effect of paddy straw mulching could be seen initially on the germination of

the seeds. It was observed that germination percentage was higher in the T₁ treatment (90%) than that of treatment T₂ (72%). This is due to availability of higher moisture content in mulched plots compared to control plots. In control plots crop, the soil is exposed to hot and dry weather conditions of October month due to which soil moisture lost rapidly through evaporation. However, in mulched plot, soil moisture was conserved due to suppression of evaporation loss. Average soil moisture data for the incremental depth when analyzed, revealed that moisture content in mulched plots was 36.8 per cent higher than that control plots throughout the crop season (Table 1). Flowering in the mulched plots was delayed by 5 days in mulched plot as that of control plots. This showed that the crop in mulched field reached to maturity later than that in control plots, this was due to availability of higher moisture for the crop in mulched field. Average plant height at the maturity in the mulched field was around 120 cm whereas in the control plots it was recorded as 95 cm only (Table 2). Thousand grain weight in the mulched plots was observed to be 3.5 g which was higher in comparison with control plot, which was recorded as 2.2 g on an average (Table 2). Similarly, primary branches, secondary branches, pods per plant and seeds per pod were also noted higher in mulched plots in comparison to control. The yield of mustard showed the similar trend. It was also observed that the mulched plots were lesser infected by weeds compared to control plots. The yield for mulched plot was observed to be 475 kg/ha, whereas for control plot it was merely 320 kg/ha (Table 2). This significant increase of yield of crop is attributed to higher moisture availability for the crop throughout the season.

CONCLUSION

The study revealed that the paddy straw mulching helps in *in-situ* moisture conservation and which in turn increase the yield of mustard crop.

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Table 1: Soil moisture content during the crop season

Treatments	Average Moisture Content (%)					
	10 DAS	25 DAS	50 DAS	75 DAS	90 DAS	Average
Mulching	13.8	11.5	10.8	8.5	7.6	10.4
Control	10.5	8.3	7.4	6.2	5.5	7.6

Table 2: Yield attributes of mustard

Treatments	Plant Height (cm)	Primary Branches (Nos.)	Secondary Branches (Nos.)	Pods per Plant (Nos.)	Seeds per Pod (Nos.)	Thousand Seed Weight (g)	Yield (kg/ha)
Mulching	120	4.5	7.8	100.5	8.8	3.5	475
Control	95	4.1	3.8	88.3	7.6	2.2	320

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