

EFFECT OF MULCHING ON POD YIELD AND YIELD ATTRIBUTES IN FRENCH BEN (*PHASEOLUS VULGARIS* L.)

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Abstract: Field investigation was conducted at Institute of Agriculture, Visva-Bharati University, West Bengal (India) during rabi season, 2012-13 on laterite soil, to study the effect of mulching on pod yield and yield attributes in French bean (*Phaseolus vulgaris* L.) under different types (paddy straw, rice husk and saw dust) and quantities (5, 7.5 and 10 t ha⁻¹) of mulches and no mulch condition. The statistical analysis revealed on yield attributes were significantly influenced by mulching and the best results revealed for average number of pods per plant (9.93), pod length (13.45 cm), pod diameter (0.95 cm), average pod weight (8.52 g), pod yield per plant (51.18 g), pod yield per hectare (11.75 t ha⁻¹) and benefit-cost ratio (2.18) under paddy straw mulch @ 10 t/ha.

Keywords: French bean, Mulching, Yield.

Introduction: French bean (*Phaseolus vulgaris* L.) is a popular vegetable cultivated mainly tropical and subtropical region of the world. French bean being a nutritious vegetable (pod contain 1.7% protein, and dry seed contains 21.1% protein per 100 g of edible part (Ali and Kushwaha 1987) growing and consuming of this vegetable can be best alternative for protein malnourishment particularly to the vulnerable population (children and women) in India. Growth and development of any crop basically depends on water, but adequate water availability is now a major challenge for Indian agriculture, especially in rain fed areas. Vegetable cultivation during *rabi* season is limited by acute soil moisture deficit, deep ground water table, very limited and uncertain ill distributed rainfall. Therefore, adoption of cheap and locally available water conservation techniques like mulches is essential. Mulching involves placing organic or synthetic materials on the soil around plants to provide a more favorable environment for growth and production (Bhatt & Khera 2006). Higher pod yield is always an important character and it is depends on growth and yield attributing characters. So, the present study was carried out to assess the effect of mulching on yield and yield attributes in French bean (*Phaseolus vulgaris* L.)

Materials and methods: The field experiment was conducted on French bean at the Horticulture farm, Institute of Agriculture, Visva-Bharati, West Bengal during Rabi season of 2012-13 according to the recommendation of package of practices along with the protection measures. Visva-Bharati is situated (23° 42' N latitude and 87° 40' 30" E longitude). The soil of the experiment was sandy loam with P^H 6.1 pods per plant under paddy straw 10 t ha⁻¹ (9.93) might be due to more conservation of moisture help full for better physiological process and reduced stress conditions increases the chances of remaining more flowers on plants (low flower drop), ultimately high

having low organic matter (0.63%). The experiment was laid out in the randomized block design (RBD) with ten treatments i.e., Paddy straw mulch, rice husk mulch and saw dust mulch each of @ 5, 7.5, 10 t/ha and no mulch treatment with three replications. The crop was sown on 3rd December at 15x15 cm spacing and harvested by final picking on March 5, 2013. The crop was fertilized with recommended dose of N, P and K @ 100, 80 and 60 kg/ha, respectively. The full dose of P₂O₅ (500 kg/ha) and K₂O (100 kg/ha) and ½ (108.7 kg/ha) of nitrogen was applied as basal. Rest of N was top-dressed. Mulches were applied just after sowing of seed in between the seeded rows uniformly as per treatment. Measured quantity of life saving irrigations were applied each plots uniformly. During the crop growth and development, periodic data was recorded for, average number of pods per plant, pod length, pod diameter, average pod weight, pod yield per plant, pod yield per hectare and finally benefit-cost ratio is worked out. Data obtained was statistically analyzed.

Results and discussion: Significant effect of different types and quantities of mulches was observed in average number of pods per plant, pod length, average pod weight, pod yield per plant, pod yield per hectare and benefit-cost ratio of French bean.

Highest average no. of pods per plant was observed (Table I) with the application of highest quantity of mulches (10 t ha⁻¹) of different kinds compared to the lowest (5 t ha⁻¹) and moderate level (7.5 t ha⁻¹) of application. The lowest average no. of pod per plant (6.27) was recorded in T₁₀ (no mulch). High average no. of

chances of fruit set results high average number of pods per plant in mulched plots. A supportive finding of Mozumder *et al.* (2002) indicates with straw improves average no. of pods per plant in French bean.

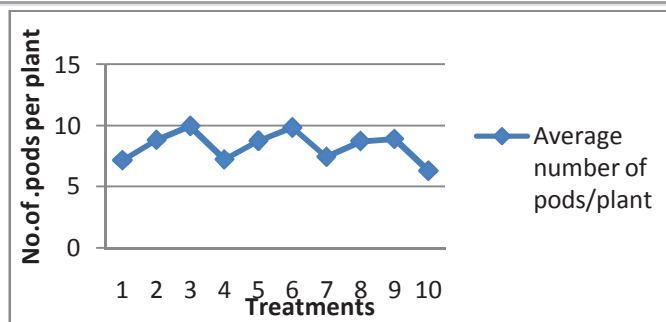


Fig.1:Effect of mulching on average number of pounds per plan(g) in French bean(*phaseolus vulgaris L*)

Highest value on average pod weight observed (Table.I) under paddy straw mulch@10t/ha (8.52g), it is at par with paddy straw and saw dust mulches in both the quantities of 7.5 and 10 t/ha and rice husk mulch @7.5t/ha whereas the lowest value of this trait (6.26 g) was recorded under no mulched treatment. Production of heaviest pod might be due to prolong

retention of moisture under paddy straw mulch @10 t.ha⁻¹ facilitates better absorption of water and nutrients particularly at critical stage i.e., pod development stage helps to attain maximum weight of the pod. Similar results obtained by Singh *et al.* (2011), in French bean with dry grasses increases average pod weight/plant.

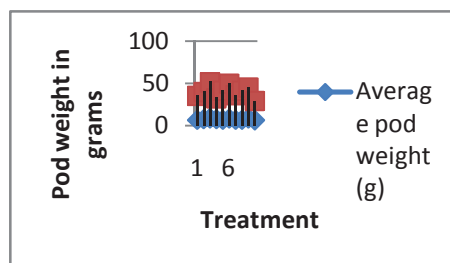


Fig:2: Effect of mulching on avarage podweight and yield per plant(g) in french bean(*phaseolus vulgaris L.*)

Highest pod yield per plant (51.18 g) was observed (Table.I) in paddy straw mulch @10 t/ha (T₃) followed by T₆ (49.59 g) and T₉ (44.73 g) where rice husk and saw dust were used for mulching, respectively, at maximum quantity (10t/ha).The lowest pod yield per plant (29.13 g) was recorded in T₁₀ (no mulch).This is a dependent factor on average number of pods per plant and average pod weight, since, the hike in these parameters under paddy straw mulch @10 t ha⁻¹ automatically reflects high average yield per plant under same treatment i.e., paddy straw mulch @10 t ha⁻¹.The results are supporting with findings of Singh *et.al* (2011) who observed Mulching of French bean with dried grasses and crop residues led to increase in pod yield/plant.Highest pod length (13.45 cm) was noticed (Table.I) in Paddy straw mulch @10t/ha which is superior over all other treatments and it is very close to Rice husk mulch@10t/ha. However, no mulch plots recorded significantly lower (11.19 cm) pod length over all other treatments .The results approximately conform with findings of Ossom and Matsenjwa(1983) in french bean under straw mulch

condition.Regarding pod diameter existence of significant difference among the treatments was not observed but numerical hike in Paddy straw mulch @10t/ha was observed, similar findings reported by Sarangi and De (2005). Highest yield (t/ha) observed (Table.I) under paddy straw mulch @10t/ha (11.75 t/ha) and it is followed by T₆ and T₉ (rice husk mulch10t/ha and saw dust mulch 10t/ha). The lowest pod yield (7.10t/ha) was recorded in plots under no mulch condition. Similar findings of Gupta and Gupta (1982) observed grass mulch improved yield in legumes. Production of highest yield may be due to availability of optimum soil moisture throughout the life cycle of the crop were given might have favoured the cell division, cell elongation, cell turgidity, better opening of stomata, transport of nutrients and finally increasing the partitioning of photosynthates to sink resulting in better growth and expression of yield potential (Tomar 2001) under paddy straw mulch @10t/ha.

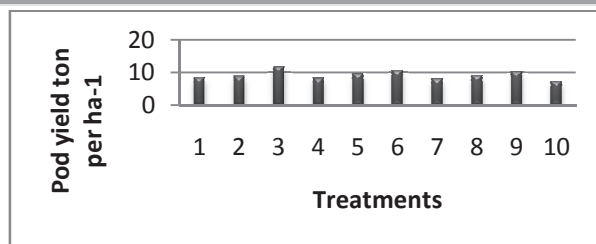


Fig: 3: Effect of Mulching on Pod yield in (t ha⁻¹) in French bean (*Phaseolus vulgaris* L.)

The highest Benefit-Cost ratio was recorded from the treatment paddy straw@10t/ha, which is followed by T₆- rice husk mulch@10t/ha and T₉-saw dust mulch@10t/ha this two treatments are significantly high Benefit-Cost ratio than all other treatments. No mulch treatment showed lowest benefit cost ratio, although, it is showing positive economic return. Supportive results by Mozumdar *et al.* (2002) and Muniram *et al.* (1988) observed paddy

Conclusion: Therefore, it was evident from the above results, application of paddy straw mulch@ 10 t h⁻¹ helps to produce high yield with high Benefit-Cost ratio in French bean .So, it is best suited to the farmers in the areas where the soil moisture deficit due to limited rain fall, deep ground water table and scarcity of alternative water resources.

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