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Effect of different mulches on yield and economics of black gram (*Vigna mungo* L.) under rainfed condition

Sabne KS, Karanjikar PN, Survase RT, Pandit SG and Dudde PS

Abstract
The field experiment was carried out at the Experimental Farm Agronomy Section, College of Agriculture, Latur, during the 2020–2021 *kharif* season, to analyse the effect of different mulches on growth, yield and quality of black gram under rainfed condition. The experimental plot's soil had a clay texture and was somewhat alkaline (pH 7.8). The design of the experiment was a Randomised Block Design. There were three replications of the seven treatments. The treatments were T_1: Control, T_2: Straw mulch @ 5 t/ha, T_3: Spreading of FYM @ 5 t/ha**,** T_4: Hand weeding cum live mulch**,** T_5: Spreading of glyricidia/leucaena tree leaves/lopping**,** T_6: Soil mulch by 1 hoeing**,** T_7: Soil mulch by 2 hoeing. The gross and net plot size of each experimental unit was 5.40 m x 4.50 m and 4.5 m x 3.9 m, respectively. The result showed that the application of hand weeding cum live mulch (T_4) gave significantly higher seed yield, straw yield, biological yield, gross return, net return and B: C ratio. Hand weeding cum live mulch being (T_4) statistically at par with straw mulch (T_2) and farm yard manure (T_3) of black gram as compared to no mulch.

Keywords: Black gram, straw, farm yard manure, glyricidea leaves, soil mulch by hoeing, economics

Introduction
Black gram (*Vigna mungo* L.) is a pulse crop that is a member of the papilionaceous subfamily of the Leguminosae family. Other names for it are mash bean, urad bean, mungo bean and urid. Black gram is a fantastic source of tasty and easily digestible protein of high quality. Black gram has 26% protein, almost three times that of grains, in addition to other minerals and vitamins. Dal is only one of the several ways people eat it. Dehusked cotelydon is used to make idli, dosa, and other fermented dishes. It is also used to make non-fermented delicacies such boiled Dal, hopper, papad, and waries (spicy hollowballs). Animal feed is made from the plant. It's also a better crop for green manure and conserving soil. It is highly nutritious and recommended for those with diabetes. When consumed in its complete form, black grammes are an excellent source of fibre, protein, several vitamins, and vital minerals like calcium and iron. Black gram has 1.4 percent fat, 3.2 percent minerals, 0.9 percent fibre, 59.6 percent carbohydrates, 154 mg of calcium, 385 mg of phosphorus, 9.1 mg of iron, 347 kcal of calorific value and 10.9 percent moisture. In black gram, phosphoric acid is plentiful. By improving the physical properties of the soil, conserving nitrogen for later crops, and lowering the demand for artificial fertilizers which pollute the environment, it also makes a substantial contribution to maintaining soil fertility. Black gram contains niacin, riboflavin, vitamins B_1, B_2, and vital amino acids. More sandy than light cotton soils are suitable for growing black gram. It is a tropical crop with self-pollinating, deeply established tap roots that can withstand drought. The optimal temperature range for growth is 27–30.0 °C. The third significant pulse crop is black gram (urid), which has the potential to significantly increase India's production of pulses. 1st advance estimates show that black gram production in *kharif* 2021–2022 was 20.5 lakh tonnes over an area of 39.43 lakh hectares (Anon. 2021) [1]. In the years 2020–21, Andhra Pradesh produced 3.65 lakh tonnes of black gram on an area of 3.93 lakh ha (Anon. 2021) [1]. More than 70% of the world's black gram is produced in India, which is also the top producer.
In order to manage weeds through soil solarization and conserve soil and water, mulching is the practice of covering the ground between rows of crops or around tree trunks with any suitable material. This method strengthens the structure of the soil, prevents weed growth, and increases soil moisture retention. Mulching can be done in a variety of ways, such as on the ground, vertically, with polythene, with pebbles, with dust, with live vegetative barriers, with straw, and more. Mulching has several advantages, such as regulating soil temperature, reducing soil erosion, and raising soil moisture levels. In terms of soil fertility, soil structure,

and soil biological regime, it helps with improvisation. The change of the plant's microenvironment is a benefit of mulching. Mulching is a powerful tool for changing the microclimate in open spaces. Due to its great water efficiency, pulses can be cultivated in places that are prone to drought and assist to increase soil fertility by fixing nitrogen in the soil. Live mulch are slowing the growth of weeds and protecting soil from water and wind erosion.

Materials and Methods

A field experiment was conducted during *kharif* season of 2021 at experimental farm department of Agronomy Latur, to study "Effect of different mulches on growth, yield and quality of black gram (*Vigna mungo* L.) under rainfed condition". The experimental plot's soil had a clayey texture, was medium in available phosphorous (18.2 kg ha-1), moderate in available nitrogen (125.3 kg ha-1), and extremely high in available potassium (498.58 kg ha1). The pH of the soil was 7.8, which indicated a somewhat alkaline reaction. The design of the experiment was a Randomised Block Design. There were three replications of the seven treatments. The treatments were T_1: Control, T_2: Straw mulch @ 5 t/ha, T_3: Spreading of FYM @ 5 t/ha, T_4: Hand weeding cum live mulch, T_5: Spreading of glyricidia/leucaena tree leaves/lopping, T_6: Soil mulch by 1 hoeing, T_7: Soil mulch by 2 hoeing. Each experimental unit had a gross plot size of 5.40 m x 4.50 m and a net plot size of 4.5 m x 3.9 m.

Results and Discussion

Effect of different mulches

Yield

Due to different treatments grain yield (kg ha^{-1}), straw yield (kg ha^{-1}), Biological yield (kg ha^{-1}) and harvest index % was influenced significantly (table 1). The significantly higher seed yield (2129 kg ha^{-1}), straw yield (4360 kg ha^{-1}), and biological yield (6489 kg ha^{-1}) was produced with hand weeding cum live mulch (T_4) which was at par with spreading of FYM @ 5 t/ha (T_3) and Straw mulch @ 5 t/ha (T_2) and also found significantly superior over rest of the treatment. Application of control treatment (T_1) observed lower seed yield (730 kg ha^{-1}), straw yield (1456 kg ha^{-1}) and Biological yield (2186 kg ha^{-1}). Increase in grain yield, straw yield, Biological yield might be due to mulching improves plant growth by altering the microenvironment by preserving moisture by lowering evaporation, controlling soil moisture, and weed control. Similar results were given by Savani *et al*., (2017) [6], Solanki *et al.*, (2019) [7], Deka *et al.*, (2020) [3], Pradhan and Singh (2022) [5], Jadhav *et al*., (2020) [4].

Economics

The gross monetary return (GMR), cost of cultivation, net monetary return (NMR) and benefit cost ratio were influenced significantly due to different treatments (Table 2). The significantly highest gross monetary return (₹ 104321 ha^{-1}) and net monetary return (₹ 69442 ha^{-1}) and B:C ratio (2.99) obtained with the application of hand weeding cum live mulch (T_4). This treatment was found significantly superior over rest of the treatments and which was at par with spreading of FYM @ 5 t/ha (T_3) and Straw mulch @ 5 t/ha (T_2). Similar results were given by Solanki *et al.*, (2019) [7], Jadhav *et al*., (2020) [4], Awal *et al.*, (2016) [2]. The control treatment (T_1) observed lowest gross monetary return (₹ 35802 ha^{-1}) and net monetary return (₹5225 ha^{-1}) and B:C ratio (1.08). Similar results were given by Solanki *et al.*, (2019) [7], Jadhav *et al*., (2020) [4].

Conclusion

On the basis of present investigation it can be concluded that the result showed that different mulches affected yield attributes and economic attributes of black gram over no mulch. Hand weeding cum live mulch (T_4) recorded higher seed yield (2129 kg ha^{-1}), straw yield (4360 kg ha^{-1}), and biological yield (6489 kg ha^{-1}) which achieved profitable gross monetary return (₹ 104321 ha-1), net monetary return (₹ 69442 ha^{-1}) and B:C ratio (2.99).

It was followed by spreading of FYM @ 5 t/ha (T_3) and Straw mulch @ 5 t/ha (T_2).

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