Environment and Ecology 40 (4) : 2028—2032, October–December 2022
ISSN 0970-0420

# Effect of Date of Sowing and Leaf Mulching on Mungbean (*Vigna radiata* L.) under Custard Apple (*Annona squamosa* L.) Based Agri-Horti System

**Pravesh Kumar, Anil Kumar Verma, Ram Kumar Singh, Hari Om, S. K. Pandey**

Received 12 May 2022, Accepted 5 July 2022, Published 19 October 2022

## ABSTRACT

A field study was carried out to evaluate the effects of date of sowing (24 July, 4 August, 14 August and 24 August) and Leaf Mulching (0 ton ha$^{-1}$ and 5 ton ha$^{-1}$) on growth and yield of mungbean. The results revealed that higher number of pods per plant, number of grains per pod, 1000-grain weight and harvest index were produced by 4 August and 5 ton ha$^{-1}$. Similarly maximum biological and grain yield (2040, 558 kg ha$^{-1}$) was produced by 4August sowing and in case of use leaf mulching maximum biological and grain yield (1789, 488 kg ha$^{-1}$, respectively) were produced.

**Keywords** Custard apple, Mungbean, Sowing dates, Leaf mulching, Growth attributes.

Mr. Pravesh Kumar[1], Hari Om[1] *
[1]Assistant Professor, Department of Agronomy, Bihar Agricultural University, Sabur, Bhagalpur, Bihar

Anil Kumar Verma[2], Dr. Ram Kumar Singh[2]
[2]Scholar and Professor, Department of Agronomy, Banaras Hindu University, Varanasi, UP, India

S. K. Pandey[3]
[3]Assistant Professor, Department of Statistics, Rashtriya Kisan PG College Shamli, UP, India
Email : hariomiari9652@gmail.com
*Corresponding author

## INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek] is an important pulse crop of *kharif* season in India. The crop is highly sensitive to environment. Therefore, time of sowing shows remarkable influence on the growth and productivity of mungbean in *kharif* due to rainy season (Brar *et al*. 1988).Too early sowing may result in poor plant stand, while yield from very late sown crop may be low due to unfavorable agro-climatic condition for the growth and development of mung bean (Sadeghipour 2008).Optimum time of sowing of mungbean may vary from variety to variety and season to season due to variation in agro-ecological conditions. Therefore, there must be a specific sowing dates to obtain maximum yield. Delayed sowing and early sowing reduces yield of mungbean. Too early sowing may not successfully germinate, while yield from too late sown crop may be low due to unfavorable condition for growth and development of mungbean (Hossain *et al*. 2009).

Leaf mulching is done for various reasons but water conservation and erosion control are the most important. Mulching is an effective way to reduce evaporation losses. It is estimated the about 60 to 75% of the rainfall is lost through evaporation. These evaporation losses can be reduced by applying mulches. This improves root growth, increases the infiltration of water, and also improves the water holding capacity of the soil. Application of leaf biomass enriches

the native soil fertility which helps in higher crop productivity.

## MATERIALS AND METHODS

The experiment was carried out at the agroforestry block of Agronomy farm of Rajiv Gandhi South Campus, Barkachha Mirzapur (BHU) which is situated in *Vindhyan* region (25º10' latitude, 82º37' longitude, occupying over an area of more than 1000 ha where variety of crops like agricultural, horticultural, medicinal and aromatic plants are grown. *Vindhyan* soil comes under rainfed and invariably poor fertility status catagory. This region comes under agro-climatic zone III A (semi-arid eastern plain zone).

The field experiment was laid out during *kharif* season in seven years old custard apple which was planted at a spacing of 5m x 5m. Green gram was sown as an intercrop. The experiment was conducted in factorial Randomized Block Design having four date of sowing and 5 t $ha^{-1}$ use of leaf mulching (Siris) and without mulching in green gram (*Vigna radiata* L.) with three replication.

The experiment was comprised of the following treatments $D_1$ = 24 July, $D_2$ = 4 August, $D_3$ = 14 August, $D_4$ = 24 August and $M_0$ = 0 t and $M_1$ = 5 t mulch $h^{-1}$. A basal dose of fertilizer 20 kg N and 40 kg $P_2O_5$ $ha^{-1}$ and 40 kg $K_2O$ was side drilled immediately after seeding.

All other practices were kept normal in all plots as per recommendations. By thinning plant to plant distance was kept at about 10 cm. At maturity, plant height, number of nodules, number of leaf, number of pods per plant, number of grains per pod,1000-grain weight, biological yield, seed yield and harvest index were recorded by following the standard procedures. Analysis of variance technique was employed to analyze the data. Differences among the treatment means were compared using least significant difference (LSD) at 5% probability level (Steel and Torrie 1984).

## RESULTS AND DISCUSSION

### Effect of date of sowing

In the present study the results showed comparatively higher grain yield from 04 August which has higher values of growth attributes viz. plant height, number of trifoliate leaf $plant^{-1}$, number of nodule $plant^{-1}$ and dry matter accumulation $plant^{-1}$ than 14 August and 24 August sowing (Table 1) might have led the plants to produce higher yield. Similar results were also obtained by Singh *et al.* (2012). However, reduced growth parameters at 24 July resulted into decreased yield attributes and ultimately into yield probably due to heavy and continuous more rainfall at early stage. Sowing of 04 August crop remained in the field for relatively longer period and accumulated more photosynthesis. The higher grain yield and biological yield at 04 August sowing indicated that the vegetative growth had positive association with grain yield. For higher grain yield not only vegetative growth but efficient utilization of photosynthesis in economic sink development is also important.

**Table 1.** Effect of date of sowing and leaf mulching on growth attributes of mungbean under custard apple based agri-horti system.

| Treatments | Growth attributes | | | |
|---|---|---|---|---|
| | Plant height of harvest (cm) | Number of trifoliate leaf $plant^{-1}$ | Number of nodule $plant^{-1}$ | Dry matter $plant^{-1}$ (g) |
| Date of sowing | | | | |
| 24 July | 43.9 | 5.2 | 6.8 | 6.50 |
| 04 August | 53.6 | 3.5 | 10.3 | 10.01 |
| 14 August | 39.2 | 1.4 | 2.6 | 7.50 |
| 24 August | 28.5 | 0.5 | 1.8 | 3.05 |
| SEm± | 1.8 | 0.2 | 0.74 | 0.24 |
| CD (0.05) | 5.5 | 0.6 | 2.25 | 0.74 |
| Leaf mulching | | | | |
| 0 t $ha^{-1}$ | 36.8 | 2.3 | 3.8 | 5.92 |
| 5 t $ha^{-1}$ | 45.8 | 3.0 | 6.97 | 7.59 |
| SEm± | 2.5 | 0.3 | 1.05 | 0.34 |
| CD (0.05) | 7.8 | NS | 3.18 | 1.05 |
| D × M interaction | NS | NS | S | S |

Response to sowing dates also revealed significantly higher accumulation of dry matter $plant^{-1}$ in 04 August sowing than other dates of sowing at all the stages of crop growth and this might have resulted in production of higher biological yield. The reason for more dry matter accumulation in 04 August sowing was more accumulation of photosynthesis due to increased number of trifoliate leaf $plant^{-1}$ that contrib-

**Table 2.** Interaction between date of sowing and leaf mulching for number of nodule plant$^{-1}$ on mungbean under custard apple based agri-horti system.

| Treatment | | Date of sowing | | | |
|---|---|---|---|---|---|
| | | 24 July | 04 August | 14 August | 24 August |
| Leaf mulching | 0 t ha$^{-1}$ | 6.20 | 5.87 | 1.87 | 1.47 |
| | 5 t ha$^{-1}$ | 7.40 | 14.87 | 3.47 | 2.13 |
| SEm± | | 1.48 | | | |
| CD (0.05) | | 4.50 | | | |

**Table 3.** Interaction between date of sowing and leaf mulching for dry matter plant-1 on mungbean under custard apple based agri-horti system.

| Treatment | | Date of Sowing | | | |
|---|---|---|---|---|---|
| | | 24 July | 04 August | 14 August | 24 August |
| Leaf Mulching | 0 t ha$^{-1}$ | 6.33 | 8.53 | 5.38 | 2.97 |
| | 5 t ha$^{-1}$ | 6.67 | 11.50 | 9.06 | 3.13 |
| SEm± | | 0.49 | | | |
| CD (0.05) | | 1.49 | | | |

uted towords more photosynthesis. Other dates viz. 14 August and 24 August which were sown late could not accumulate sufficient dry matter because of lesser vegetative and reproductive period. This might have affected adversely the production of photosynthates and its translocation towards seeds. Increasing trend in growth parameters viz. plant height and dry matter accumulation, up to maturity in early sowings (24 July and 04 August) and decreasing trend in late sowings (14 August and 24 August) (Singh *et al*. 2012) might be due to enhanced leaf shedding due to high temperature and less water availability.

Significantly highest number of nodules plant$^{-1}$ was obtained with the application of 5t ha$^{-1}$ leaf mulch at 04 August sowing while in control highest value recorded with 24 July sowing though it was found at par with 04 August and 14 August sowing but significantly higher with 24 August sowing (Table 2).

Interaction results of Table 3 showed that significantly highest dry matter was found with application of 5 t ha$^{-1}$ leaf mulch at 04 August sowing over remaining dates. Similar results were also found in control.

Decreased grain yield ha$^{-1}$ obtained at 24 July and found highest at 04 August and decreased thereafter with delay in sowing up to 24 August (Table 4). These findings are also corroborated with the findings of Jahan and Adam Golam (2012). The higher yield in 04 August can be attributed to higher yield attributes viz. higher number of pod plant$^{-1}$, number of seed pod$^{-1}$ and test weight and reduced yield due to lower yield attributes in delay in sowing (Table 2).

Results revealed that significantly highest seed

**Table 4.** Effect of date of sowing and leaf mulching on yield and yield attributes of mungbean under custard apple based agri-horti system.

| Treatments | Yield and yield attributes | | | | | | |
|---|---|---|---|---|---|---|---|
| | Number of pod Plant$^{-1}$ | Number of seed Pod$^{-1}$ | Test weight (g) | Seed yield (kg ha$^{-1}$) | Straw yield (kg ha$^{-1}$) | Biological yield (kg ha$^{-1}$) | Harvest index (%) |
| Date of sowing | | | | | | | |
| 24 July | 5.53 | 9.0 | 26.1 | 371 | 1008 | 1380 | 25.52 |
| 04 August | 8.50 | 9.6 | 28.4 | 558 | 1481 | 2040 | 27.16 |
| 14 August | 6.53 | 7.3 | 28.0 | 382 | 1019 | 1401 | 27.00 |
| 24 August | 3.83 | 6.9 | 25.6 | 213 | 650 | 864 | 24.45 |
| SEm± | 0.39 | 0.3 | 0.8 | 24 | 43 | 66 | 0.63 |
| CD (0.05) | 1.18 | 1.14 | 2.6 | 73 | 131 | 201 | NS |
| Leaf mulching | | | | | | | |
| 0 t ha$^{-1}$ | 4.85 | 7.2 | 25.9 | 274 | 779 | 1053 | 25.52 |
| 5 t ha$^{-1}$ | 7.35 | 9.2 | 28.1 | 488 | 1130 | 1789 | 27.04 |
| SEm± | 0.55 | 0.9 | 1.1 | 34 | 61 | 94 | 0.89 |
| CD (0.05) | 1.67 | 1.61 | 1.59 | 104 | 186 | 285 | NS |
| D × M interaction | NS | NS | NS | S | S | S | NS |

**Table 5.** Interaction between date of sowing and leaf mulching for seed yield (kg ha$^{-1}$) on mungbean under custard apple based agri-horti system.

| Treatment | | Date of sowing | | | |
|---|---|---|---|---|---|
| | | 24 July | 04 August | 14 August | 24 August |
| Leaf mulching | 0 t ha$^{-1}$ | 287 | 396 | 228 | 184 |
| | 5 t ha$^{-1}$ | 455 | 720 | 536 | 242 |
| SEm± | | 49 | | | |
| CD (0.05) | | 47 | | | |

**Table 6.** Interaction between date of sowing and leaf mulching for straw yield (kg ha$^{-1}$) on mungbean under custard apple based agri-horti system.

| Treatment | | Date of sowing | | | |
|---|---|---|---|---|---|
| | | 24 July | 04 August | 14 August | 24 August |
| Leaf mulching | 0 t ha$^{-1}$ | 820 | 1071 | 628 | 599 |
| | 5 t ha$^{-1}$ | 1197 | 1892 | 1411 | 702 |
| SEm± | | 49 | | | |
| CD (0.05) | | 147 | | | |

yield was obtained with application of 5 t ha$^{-1}$ leaf mulch at 04 August sowing which was significantly superior with remaining dates. Lowest seed yield was obtained in 24 August sowing (Table 5).

Significantly highest straw yield obtained with the application of 5 t ha$^{-1}$ leaf mulch at 04 August sowing over rest of the dates. Lowest straw yield was found at 24 August sowing with the application of 5 t ha$^{-1}$ leaf mulch as well as in control (Table 6).

Highest significant difference recorded with the application of 5 t ha$^{-1}$ leaf mulch at 04 August sowing, over other dates. Lowest biological yield was obtained at 24 August sowing in the application of 5 t ha$^{-1}$ leaf mulch and control both (Table 7).

**Table 7.** Interaction between date of sowing and leaf mulching for biological yield (kg ha$^{-1}$) on mungbean under custard apple based agri-horti system.

| Treatment | | Date of sowing | | | |
|---|---|---|---|---|---|
| | | 24 July | 04 August | 14 August | 24 August |
| Leaf mulching | 0 t ha$^{-1}$ | 1107 | 1467 | 856 | 783 |
| | 5 t ha$^{-1}$ | 1652 | 2612 | 1194 | 944 |
| SEm± | | 133 | | | |
| CD (0.05) | | 403 | | | |

**Effect of leaf mulching**

The finding of the present study indicate that growth attributes of crop such as plant height, number of trifoliate leaf plant$^{-1}$ number of nodule plant$^{-1}$ and dry matter accumulation plant$^{-1}$ had significant variation under mulches. The growth attributes had higher values with 5 t ha$^{-1}$ mulches compared to 0 t ha$^{-1}$ mulch (Table 1). Enhanced growth parameters in 5 t ha$^{-1}$ mulching might be due to addition of organic matter turned into humus and resultantly into increased nutrient retention capacity of the soil by increasing effective cation exchange capacity. Also the fact that mulch covers the soil there by reducing the rate of water removal from the soil surface to the atmosphere i.e. evaporation. It's also protect the soil and its organic content from direct content with warm air thus increasing soil microbial activity consequently encouraging decomposition is probably the reason for high growth. Similar findings were also made by Sale (2013), Vanlalhluna and Sahoo (2011), Liasu *et al*. (2007).

Dry matter accumulation increased with use of 5 t ha$^{-1}$ mulch. This influence of treatment may be attributed touse 5 t/ha mulch and increased and the beneficial effects on production due to mulch. The similar reasons were also proposed by Sale (2013).

Yield attributes, which determine yield, is the resultant of the vegetative development of the plant. All the attributes of yield viz., number of pods plant$^{-1}$, number of grains pod$^{-1}$ and 1000 grain weight were maximum under 5 t ha$^{-1}$ mulch use (Table 4). Yield attributing characters are function of growth during vegetative phase of the plant. The reason for increased number of pod plant$^{-1}$ in 5 t ha$^{-1}$ mulch may be attributed to increased dry matter accumulation.

Yield is the result of co-ordinate interplay of yield attributes viz., number of pod plant$^{-1}$, number of seed pod$^{-1}$ and 1000 grain weight which were improved due to mulch application. The maximum number of pod plant$^{-1}$, seed pod$^{-1}$, test weight, grain yield, straw yield and biological yield was recorded in 5 t ha$^{-1}$ much

application better than 0 t $ha^{-1}$ mulch application. This could be attributed to better supply of nutrients and increase in the soil moisture retention capacity. In general the cover of mulch creates a favorable micro-climate for the activities of soil microorganisms which help to improve and maintain the biological and physico-chemical qualities of the soil thereby improving the performance of growth and resultantly in yield attributes and yield. Similar findings were also made by Sharma *et al.* (1998), Bhattacharya *et al.* (1995) Tilander (1993) and Mwangi and Peter (1989).

## CONCLUSION

The date of sowing on 4 August was found optimum as compared to other date of sowing (24 July, 14 August and 24 August) and leaf mulching 5 t $ha^{-1}$ is more beneficial for higher yield and net return over no mulching in mungbean under custard apple based agri-horti system in *Vindhyan region.*

### REFERENCES


Bhattacharya BK, Dalla M, Mitra S (1995) Effect of leaf mulches on soil moisture conservation, growth and yield of blackgram in upland soils of Tripura. *Agropedology* 8 : 19-24,

Brar ZS, Singh M, Singh G (1988) Effect of planting dates and growth regulators on production of mungbean. *J Res Punjab Agricult Univ* 25: 515-520.

Hossain AM, Prodhan MZH, Sarker AM (2009) Sowing dates: A major factor on the incidence of major insect pests and yield of mungbean *J Agric Rural Dev* 7(1&2) :127-133.

Jahan Nargis, Adam Golam MM (2012) A growth and yield performance of Bari mung-5 under different time of sowing. *J Bangladesh Acad Sci* 36 (2) : 227-231.

Liasu MO, Achakzai Khan, Kabir Abdul (2007) Influence of *Tithonia diversifolia* leaf mulch and fertilizer application on the growth and yield of potted tomato plants. *Am Euras J Agric Environ Sci* 2 (4): 335-340,

Mwangi W. Peter (1989) Effect of *Leucaena leucocephala*, *Cassia siamea* and *Terminalia brownii* leaf mulch on maize performance and soil nutrients under the semi-arid conditions in machakos, Kenya.

Sadeghipour O (2008) Response of mungbean varieties to different sowing dates. *Pak J Biol Sci* 11(16) : 2048-2050.

Sale FA (2013) Effect of mulch of selected tree species on growth and yield of millet (*Panicum miliaceum* L.). In akure, Nigeria. Nigerian *J Agric Food Environ* 9 (1) : 45-49.

Sharma NK, Singh PN, Tyagi PC, Mohan SC (1998). Effect of leucaena mulch on soil-water use and wheat yield. *Agricult Water Manag* 35: 191–200,

Singh Sompal, Sandhu KC, Dhaliwal LK, Singh Inderjeet (2012) Effect of planting geometry on microclimate, growth and yield of mungbean (*Vigna radiata* L.). *J Agricult Physices* 12(1):70-73.

Steel RGD, Torrie JH (1984) Principles and Procedures of Statistics. A Biomatrical Approach. 2nd edn. McGraw Hill Book. Int Co Singapore, pp 172–194.

Tilander Y(1993) Effects of mulching with *Azadirachta indica* and *Albizia lebbeck* leaves on the yield of sorghum under semi-arid conditions in Burkina Faso. *Agrofor Syst* 24: 277—293.

Vanlalhluna PC, Sahoo UK (2011) Growth and yield of maize under different agroforestry systems exposed to varying cultural treatments in Mizoram, India. *Sci Vis* 11(1): 11-15.