

INTEGRATION OF MUNGBEAN (*Vigna radiata* L.) AS CASH CROP ON SHADED LAND AREAS AT CAFÉ PROJECT IN CONNER, APAYAO

ABSTRACT

The study was conducted to determine the growth and yield of mungbean integrated as a cash crop in the Conservation Agriculture in Forest Ecosystem (CAFÉ) Project sites at Barangay Guina-ang, Conner, Apayao. The CAFÉ Project was launched with the intention of promoting environmentally sound farming practices in the uplands of Apayao. The four mungbean varieties: NSIC Mg 05 – Pag-asa 11, NSIC Mg 12 – Pag-asa 19, NSIC Mg 09 – Pag-asa 15, and NSIC Mg 17 – Pag-asa 17 were planted around 2 meters away from the nearest trees in partially-shaded areas with slopes not exceeding 50 degrees. It was laid out in 5 m x 10 m quadrants arranged in Randomized Complete Block Design (RCBD) with three replications. Results of the study revealed that V₁ and V₂ were late maturing (86.50; 87.16 DAT), taller (65.25; 68.85 cm), had more pods per plant (16.72; 15.92), longer pod length (9.42; 9.36cm) more seeds per pod (12.42; 10.88), heavier seed weight (33.46; 28.49g) and higher seed yield (656.45; 610.20 kg/ha) as compared to V₃ and V₄. In conclusion, NSIC Mg 05 – Pag-asa 11 and NSIC Mg 12 – Pag-asa 19 had better growth performance and yield in partially shaded areas integrated as a cash crop in the CAFÉ Project site at Conner, Apayao.

Keywords: mungbean, cash crop, cropping combinations, maturity, yield

INTRODUCTION

Mungbean (*Vigna radiata* L.) belongs to Family Leguminosae whose determining characteristics is their ability to fix atmospheric nitrogen (N) [1]. Furthermore, mungbean seeds contain 24.7% protein, 0.6% fat, 0.9% fiber and 3.7% ash and a sufficient quantity of calcium, phosphorus and important vitamins. It has been a source of protein. Mungbean is an important short- duration crop in Pakistan [2].

In the Philippines, mungbean are small green legumes grown widely for use as a human food but can also be used as a green manure crop and as forage for livestock, source of animal feed and income [3, 12]. It is a tropical or sub-tropical crop, and require warm temperatures, annuals, highly branched and having trifoliolate leaves, upright and vine types of growth habit occur in mungbean, with plants varying from one to five feet in length. It is a drought-tolerant crop and requires a warm climate during its growing period [3]. Furthermore, mungbean is a crop with low soil requirements, a short reproductive cycle, high nitrogen fixation capacity, and environmental adaptability [4].

Large variability in cropping systems exists in rainfed dryland regions, with intercropping being more common. Furthermore, cropping systems have a significant impact on the sustainability of conservation agriculture [5]. The Conservation Agriculture in Forest

Ecosystem (CAFÉ) Project established by Apayao State College aimed to promote environmentally sound farming systems model under forest canopy in the uplands of Apayao. Specifically, the CAFÉ project is a research cum demonstration farm for the College where crop combinations and integration of cash crops like mungbean under fruit and forest trees in mid elevation site in Guinaang, Conner, Apayao were established. The mungbean in the project was a cash crop and intercropped in partially shaded and rolling areas in order to maximize the utilization of the site as the fruit trees and other crops were present. Studies on mung bean under shading stress found out that morphological traits and physiological metabolism capacities were changed in response to shading stress. Plant mechanisms in response to shading stress, and these parameters could be used to evaluate mung bean cultivars for shading tolerance [6].

This study used four mungbean varieties evaluated for their growth and yield performance on the partially shaded areas of the CAFÉ Project in Barangay Guinaang, Conner, Apayao.

OBJECTIVES

This study was conducted to determine the growth and yield of mungbean in shaded areas integrated as a cash crop in the CAFÉ Project site. Specifically, it was conducted to determine the performance of mungbean in the partially shaded areas in terms of growth duration, plant height, branches per plant, pods per plant, pod length, seeds per pod, the weight of 1,000 seeds and seed yield (t/ha).

METHODOLOGY

Selection of Mungbean Varieties

Four mungbean varieties which were commonly planted by the farmers in the locality were chosen as experimental plants. The seeds were procured at an agricultural store and were coded accordingly. The varieties were:

- V₁- NSIC Mg 05 – Pag-asa 11
- V₂- NSIC Mg 12 – Pag-asa 19
- V₃- NSIC Mg 09 – Pag-asa 15
- V₄- NSIC Mg 17 – Pag-asa 17

Experimental Treatments and Design.

The mungbean experimental site was laid out in 5 m x 10 m quadrants arranged in Randomized Complete Block Design (RCBD) with three replications.

Planting

Mungbean seeds were planted on the 1st week of February using the traditional dibble method with an approximated distances of 12 inches x 12 inches on 2-3 seeds per hill. Replanting of missing hills was done within 7 days after seeding (DAS). Mungbean were planted around 2 meters away from the nearest trees.

Inter Tillage and Cultural Management

Weeding was done manually and the weed materials were used as mulching for the mungbean plants. Since the study area was in a hilly forest zone, the plants were dependent on rainfall for its water needs. The soil type is sandy clay loam.

Nutrient Management

Fertilizer application of complete (14-14-14) and urea (46-0-0) fertilizers at the rate of 20 grams per hill dibbled 3-4 inches away from the base of the plants was done at 25 DAS. Nitrogen fertilizer applied was absorbed and utilized by mung bean [4].

Harvesting and Determination of Yield

The matured dried pods were gathered on a priming basis, sun dried, threshed and winnowed to remove the trash. Cleaned seeds were sundried and weighted. Sample pods were also selected randomly per treatment for the data on other yield components.

Statistical Analysis of Data

Data gathered for various characteristics were subjected to Analysis of Variance using the SPSS Statistical Package and means were compared through the Duncans' Multiple Range Test (DMRT) at 5% level of probability [7].

RESULTS AND DISCUSSION

A. Growth Parameters

Growth Duration

As gleaned in Table 1, V₂ had the longest duration to 87.16 days which was statistically similar with V₁ (86.50), while the V₃ and V₄ had a mean of 79.00 and 78.25 days, respectively. Data supports that V₁ and V₂ can be considered late maturing varieties while V₃ and V₄ matures early. Further, Analysis of Variation revealed that means between the different treatments in the CAFÉ project showed no difference while means between mungbean varieties were significant at 1% level DMRT with coefficient of variation computed at 0.35% and 4.58%, respectively. The study of [8] had almost similar data when the mungbean was planted on the early part of March.

Plant Height (cm)

The tallest variety was observed on V₂ with mean of 68.85 cm followed by V₁ (65.25 cm), V₄ (51.20 cm) and V₃ with 49.20 cm, respectively. As observed, the late maturing

varieties were also taller than the early maturing ones. The data gathered was parallel to the findings of [9] which reported that late maturing varieties had a plant height range from 56.60 – 60.30 cm while the early maturing was from 38.20 – 40.30 cm. Furthermore, the taller plants in the CAFÉ Project site may be attributed to the shading effect of the trees since the mungbean were planted around 2 meters away from the nearest trees. Plants that are subjected to a poor or localized light source become drawn or etiolated as they try to reach more light [10]. ANOVA computation showed that both the cropping combinations and mungbean varieties have significant difference at 5% level and coefficient of variation at 4.21% and 6.22% respectively. The morphological traits of the mungbean were significantly affected by shading stress. Due to shade stress, plant height and the length of the first internode were increased [6].

Branch per Plant

More branches were recorded in early maturing varieties, V₃ with 3.45 and V₄ (3.32), than the late maturing varieties which posted 3.16 for V₁ and 3.28 for V₂. However, there was no significant difference in the means between the different mungbean varieties and the different cropping combinations of the CAFÉ Project.

Table 1. Growth parameters of mungbean integrated as a cash crop in the CAFÉ Project Site

Varieties	Growth Duration (days)	Plant Height (cm)	Branch per plant
V1	86.50a	65.25b	3.16
V2	87.16a	68.85a	3.28
V3	79.00b	49.4c	3.45
V4	78.25b	51.2c	3.32
c.v. (%)	4.58	6.22	1.14
Level of significance	0.01	0.05	ns

B. Reproductive Parameters

Pods per Plant

The late maturing varieties, V₁ and V₂ produced the most number of pods per plant with means of 16.72 and 15.98 as compared to the early maturing varieties V₄ (15.18) and V₃ (15.14). The result run with the findings of [9] which characterized the late maturing varieties as high yielding as brought about by the more number of pods per plant. Analysis of variation showed that means between the different mungbean varieties were significantly different at 5% level DMRT but there was no significance between the cropping combinations in the CAFÉ site where the varieties were planted.

Length (cm) of Pods

Longer pods were observed from the late maturing varieties, V₁ (9.56) and V₂ (9.36), as compared to early maturing V₃ (7.24) and V₄ (7.56). This finding can be attributed to the characteristics of the mungbean HYVs [6]. Analysis of Variance revealed that means between the different treatments in the CAFÉ project showed no difference while means between

mungbean varieties were significant at 1% level DMRT with the coefficient of variation computed at 1.96% and 5.24% , respectively.

Number of Seeds per Pod

Variety 1 (V₁) had the most number of seeds per pod with a mean of 11.42 followed by V₂ (10.88), V₃ (8.85) and V₄ (8.32). ANOVA showed that means were significant at 1% level DMRT with coefficient of variation computed at 8.67%. A comparison of means on the different cropping combinations in the CAFÉ site showed no significant difference

Table 2. Reproductive parameters of mungbean integrated as a cash crop in the CAFÉ Project Site

Varieties	Pods per Plant	Length of Pods (cm)	Number Seeds per Pod
V ₁	16.72a	9.56a	11.42a
V ₂	15.98a	9.36a	10.88b
V ₃	15.14b	7.24b	8.85c
V ₄	15.28b	7.56b	8.32c
c.v. (%)	3.85	5.24	8.67
Level of significance	0.05	0.01	0.01

C. Yield Parameters

Weight of 1,000 Seeds

The heaviest weight of seeds was recorded on V₁ at 33.46g followed by V₂ (28.49), V₄ (25.12) and V₃ (24.35). It can be gleaned that the late maturing varieties registered heavier weight of seeds and as compared to the varieties with early maturity. This can be due to the bigger seeds attributed by the mungbeans with later maturity which was also the high yielding. ANOVA revealed that means between the different treatments in the CAFÉ project showed no difference while means between mungbean varieties were significant at 5% level DMRT with coefficient of variation computed at 0.79% and 7.36% respectively. The agronomic characteristics of mungbean permit to fit in various cropping system as intercrop, rotation or relay crop [11].

Seed Yield (t/ha)

The seed yield of the late maturing varieties V₁ (876.45) and V₂ (810.20) were higher as compared to the varieties with earlier maturity V₃ (632.70) and V₄ (675.35). The higher yield can be attributed to the more number of pods per plant, longer pod length, more seeds per pod, and heavier weight of seeds of the late maturing varieties. The temperature and humidity in the Philippines is suited for mungbean yields [11]. Although the seed yield was lower compared to the potential yield of the varieties tested (PNS/BAFPS, 2012), it was still considered high owing to the fact that the study was conducted under the partially shaded areas of the CAFÉ Project. The average yield of mungbean is very low not only in India (425 kg/ha) as well as in entire tropical and subtropical Asia [13].

Table 3. Yield parameters of mungbean integrated as cash crop at the CAFÉ Site

Varieties	Weight of 1,000 seeds (g)	Seed Yield (kg/ha)
V1	33.46a	876.45a
V2	28.49b	810.20b
V3	24.35c	632.70d
V4	25.12c	675.35c
c.v. (%)	7.36	3.74
Level of significance	0.05	0.01

CONCLUSION

The NSIC Mg 05 – Pag-asa 11 and NSIC Mg 12 – Pag-asa 19 were taller, had more pods per plant, longer pod length, more seeds per pod, heavier seed weight) and higher seed yield as compared to the varieties with NSIC Mg 09 – Pag-asa 15 and NSIC Mg 17 – Pag-asa 17 when integrated as a cash crop on partially shaded areas at the CAFÉ Project site in Conner, Apayao.

RECOMMENDATIONS

Based on the foregoing results and conclusion, the following recommendations were forwarded:

1. Planting of mungbean under favorable, partially-shaded, forest-based ecosystem should be promoted to augment the meager income of the upland farmers;
2. Production of IEC materials coming from the CAFÉ Project for the promotion of the generated technology.

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