

AGRO-ECONOMIC PERFORMANCE OF MUNGBEAN INTERCROPPED IN SESAME UNDER DIFFERENT PLANTING PATTERNS

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The performance of mungbean intercropped in sesame under different geometric arrangements was determined on sandy-clay loam soil at the University of Agriculture, Faisalabad for two consecutive years (2001-02). The planting patterns consisted of 40 cm spaced single rows, 60 cm spaced 2-row strips and 100 cm spaced 4-row strips while mungbean was intercropped in all the three planting patterns and also grown as a sole crop. The results evinced that planting sesame in 100 cm spaced 4-row strips explored the possibility of intercropping in sesame. It not only permitted convenient intercropping but also facilitated the harvesting and handling of intercrops without doing any damage to the base crop. Intercropping sesame with mungbean in the pattern of 100 cm spaced 4-row strips appeared to be more convenient, productive and profitable than the monocropped sesame.

Keywords: Agro-economic performance, planting patterns, intercropping, sesame

INTRODUCTION

The role of legumes as a source of vegetable protein and their beneficial effects on the soil fertility is well known. Unfortunately, these crops being grown on poor soils of rain fed areas could not benefit from the impact of green revolution, which resulted in chronic low yield and shortage of pulses in the country for the last many years. At present, gross domestic production of pulses in Pakistan is 937.3 thousand tones with net availability of 680.68 kg ha⁻¹ annum⁻¹. Pakistan spent 82.2 million dollars on import of pulses to meet the need of her population (Anonymous, 2006).

In the past monocropping of grain legumes (pulses) was usual practice among the growers but now a days, the interest in growing grain legumes as intercrops with major field crops is increasing. Recent evidence suggests that there are substantial advantages of legumes intercropping which are achieved not by means of costly inputs but by the simple expedient of growing crops together in an appropriate geometry (Nazir *et al.*, 1997, Ahmad & Saeed, 1998). When legumes are grown in association with non-legumes, there is often advantage to the non-legumes from nitrogen fixed by the legumes from nitrogen fixed by the legumes (Saeed *et al.*, 1997). Furthermore, two crops differing in height, canopy, adaptation and growth habits grow simultaneously with least competition (Kerrio & Aslam, 1986). Other suggested forms of advantages are the greater stability of yield over different seasons, better use of land resources,

possibility of better control of weeds, pests and diseases (Khan & Saeed, 1997).

Pakistan is a subtropical country having adequate irrigation and land resources with high intensity of sunlight for plant growth. Therefore, possibility of raising two or more crops on the same piece of land in a year needs to be explored for effective and efficient utilization of these natural resources. Intercropping is being looked as an efficient utilization of these natural resources. Intercropping is being considered to utilize these resources in an efficient way and is also most economical production system as it increases the production per unit area and time. Presently, interest in intercropping is increasing among the small growers because of their diversified needs and low farm income from the monocropping system.

So in the present scenario of preponderance of small holding, surplus farm family labour, overlapping of growing season of crops, low productivity of most of the crops and practice of subsistence farming, intercropping seems to be a promising strategy for increasing crop productivity particularly at small farm level in Pakistan.

The conventional method of planting sesame in 40-cm spaced single rows does not permit intercropping because of narrow inter-row spacing. Recently a new method of planting sesame in well spaced multi-row strips has been developed which not only gives relatively higher seed yield than the conventional single row planting (Nazir *et al.* 1987) but also facilitates intercropping, harvesting and handling of the intercrops without doing any damage to the base crop.

In Pakistan, no systematic research work has been done so far to explore the possibility of intercropping of various legume crops in sesame. Thus there is a need to develop an appropriate sesame-legume intercropping system. The present study was, therefore, planned to determine the agronomic performance of mungbean as intercrop in sesame under different planting patterns in irrigated environment at Faisalabad.

MATERIALS AND METHOD

The proposed study was conducted at the agronomic research area, University of Agriculture, Faisalabad during the kharif season of 2001-02 on sandy-clay loam soil. The planting patterns comprised 40 cm spaced single rows, 60 cm spaced 2-row strips and 100 cm spaced 4-row strips of sesame while 2, 3 and 4 lines of mungbean were intercropped in vacant space within these three planting patterns, respectively and also grown as sole crop. Mungbean was intercropped in sesame on the same day. The plant population of sesame was kept constant and optimum in all the three geometric arrangements. The experiment was laid out in a randomized complete block design with four replications. The net plot size was 3.2 m x 7.0 m. A basal dose of 50-100-50 kg NPK ha⁻¹ was applied at the time of sowing while additional 50 kg N ha⁻¹ was applied with first irrigation only to the sesame crop to meet its full N requirement. In all, three irrigations each of 7.5 cm were given to mature the component crops.

The first irrigation was given 20 days and second 35 days after germination while the third at flowering. Both sesame and mungbean were harvested at their physiological maturity. The crops were harvested manually at the ground level with the help of a sickle, dried in sunlight and then tied into separate bundles. Both the crops were threshed manually. The observations were recorded on the desired parameters as per treatment by using standard procedures. The data collected were statistically analyzed by using the computerized statistical programme "MSTAT-C" (Farid & Eisensmith, 1986). Analysis of variance technique was employed (Steel *et al.* 1997) and Least significance difference (LSD) test at P = 0.05 was used to compare the treatment means.

RESULTS AND DISCUSSION

On the basis of 2-year average data, the sole mungbean crop grown in 40 cm spaced single rows produced significantly higher seed yield than that grown as intercrop under different planting patterns (Table 1). Among the planting patterns, mungbean intercropped in sesame sown in the pattern of 100 cm spaced 4-row strips yielded significantly higher than that intercropped in sesame grown in 60 cm spaced paired rows or 40 cm spaced single rows. Reduction in seed yield of intercropped mungbean can be ascribed to less number of branches and seeds plant⁻¹, lower 1000-seed weight and less number of pods plant⁻¹ than sole mungbean. Differential suppressive effects of

Table 1. Agro-economic performance of mungbean intercropped in sesame under different planting patterns.

Parameters	40 cm spaced single rows (P ₁)	60 cm spaced double rows (P ₂)	100 cm spaced 4-row strips (P ₃)	Mungbean alone (P ₄)	LDS
Seed Yield of base crop (sesame) (kg ha ⁻¹)	487.7	663.3	693.9	-	21.85
Seed Yield (kg ha ⁻¹)	472.1 d	632.3 c	723.6 b	826.2 a	31.48
Braches plant ⁻¹	5.09 c	5.30 c	6.21 b	7.25 a	0.55
Pods plant ⁻¹	9.33 d	11.18 c	12.86 b	14.08 a	1.11
Seeds plant ⁻¹	70.26 c	81.44 b	84.93 b	97.96 a	5.35
Seed weight plant ⁻¹	2.74 d	3.29 bc	3.59 b	4.51 a	0.13
1000-seed weight (g)	41.13 c	42.06 bc	43.45 ab	73.88 a	1.41
Plant height (cm)	62.08 c	63.96 bc	65.87 b	68.20 a	2.14
Harvest index (%)	20.40 d	21.57 c	22.29 b	23.42 a	0.23
Seed protein concentration (%)	23.13	23.58	23.84	23.52	
Net profit (Rs. ha ⁻¹)	14316	21328	23487	16568	

Any two means not sharing a letter differ significantly at 5% level of probability (LSD).

intercropping on different yield components of mungbean grown in association with sesame under different patterns have also been reported by Deshpande *et al.* (1989), Rao (1991), Rao *et al.* (1993) and Khan (2000).

Although branching is basically a genetic character but agronomic management may influence this character. There were significant differences among different planting patterns. Mungbean grown alone in 40 cm spaced rows produced significantly greater number of branches plant⁻¹ than that grown as an intercrop in different planting patterns. These results are in line with the findings of Khan (2000) who reported a significant reduction in branches plant⁻¹ of mungbean when intercropped in cotton.

As regard planting patterns, mungbean intercropped in sesame grown in the pattern of 100 cm spaced 4-row strips produced significantly greater number of branches plant⁻¹ than that intercropped in 60 cm spaced paired rows or 40 cm spaced single rows which in turn remained at par with each other. Less number of branches in intercropped mungbean can be attributed to the shading effect of the sesame crop which suppressed the branching potential of the dominated mungbean crop and inter-crop competition for essential growth factors.

There was a significant variation in pods plant⁻¹ of mungbean at different planting patterns. Sole crop produced more number of pods plant⁻¹ than that grown as an intercrop under different planting patterns. Among the planting patterns, mungbean intercropped sesame planted in the patterns of 100 cm spaced 4-row strips produced significantly more pods plant⁻¹ than that intercropped in 60 cm spaced paired rows against the minimum of 9.33 pods plant⁻¹ when mungbean was intercropped in sesame planted in 40 cm spaced single rows. Variation in the number of pods plant⁻¹ of mungbean under different intercropping practices has also been reported by Subramanian and Maheswari (1992), Ashraf (1997) and Khan (2000).

The sole mungbean crop grown in 40 cm spaced rows produced significantly greater number of seeds plant⁻¹ (97.96) than grown as intercrop under different planting patterns. Among planting patterns, mungbean intercropped in sesame grown in the pattern of 100 cm spaced 4-row strips produced significantly the maximum seeds plant⁻¹ which was at par with that obtained in 60 cm spaced paired rows. However, the minimum seeds plant⁻¹ (97.026) were recorded for the crop intercropped in sesame grown in single rows. Similar results have been reported by Arya and Karala (1988) and Khan (2000).

There were significant differences among planting patterns. The mungbean crop grown alone in 40 cm spaced rows produced significantly more seed weight

plant⁻¹ than that grown as an intercrop under different planting patterns. Among planting patterns, mungbean intercropped in sesame planted in the pattern of 100 cm spaced 4-row strips gave significantly higher seed weight plant⁻¹ than that intercropped 60 cm spaced paired rows against the minimum seed weight plant⁻¹ of 2.74 g when mungbean was intercropped in sesame planted in 40 cm spaced single rows.

The monocropped mungbean produced significantly heavier seeds than that grown as intercrop under different planting patterns. As regards planting patterns, mungbean intercropped in sesame grown at the pattern of 100 cm spaced 4-row strips gave significantly the maximum 1000-seed weight which was statistically at par with that obtained from 60 cm spaced paired rows. The minimum 1000-seed weight was recorded for mungbean intercropped in sesame planted in 40 cm spaced paired rows intercropping system. Similarly, Sahi (1988) and Nishat (1989) also reported that 1000-seed weight of lentil was decreased in a wheat-lentil intercropping system.

The effect of intercropping on plant height of mungbean was significant. The sole crop produced significantly taller plants than that grown as intercrop under different planting patterns. Among the planting patterns, mungbean intercropped in sesame planted in the pattern of 100 cm spaced 4-row strips produced significantly taller plants which were at par with the plants grown as intercrop in 60 cm spaced paired rows of sesame. The minimum plant height was recorded when mungbean was intercropped in sesame in 40 cm spaced single rows which was at par with that grown in 60 cm spaced paired row strips. These results are not in line with those reported by Khan (2000) who found that the plant height of mungbean was not affected significantly when intercropped in cotton. The reduction in plant height of the intercropped mungbean may be due to inter-species competition for different growth factors like light and other inputs. This may also be shading effect of sesame on lower canopy of mungbean due to which photosynthetic efficiency of the intercropped mungbean was affected adversely.

The harvest index of the sole crop of mungbean was significantly higher than the intercropped mungbean. However, mungbean intercropped in sesame grown in 100 cm spaced 4-row strips gave significantly the higher harvest index value than that found in 60 cm spaced paired rows. The minimum harvest index (20.40%) was obtained when mungbean was intercropped in sesame planted in 40 cm spaced single rows. These results are in line with the findings of Hay & Walker (1989).

Seed protein concentration of mungbean intercropped in all the three planting pattern of sesame was statistically similar and was also at par with that

recorded for sole crop of mungbean which on an average varied from 23.11 to 23.84 %.

It is clear from Table 1 that in terms of monetary gain, the net benefits of intercropping system in the pattern of 100 cm spaced 4-row strips and 60 cm spaced 2-rows of sesame were higher (Rs.23487 & 21328 ha⁻¹, respectively) than those achieved from intercropping in the pattern of 40 cm spaced single rows (Rs.14316 ha⁻¹).

CONCLUSION

It is concluded that intercropping of mungbean in sesame grown in the pattern of 100 cm spaced 4-row strips is more economical and remunerative than intercropping of mungbean in sesame in the pattern of 40 cm spaced single rows and 60 cm spaced double rows.

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