EFFECT OF ROW SPACING AND TIME OF WEEDING ON THE GROWTH AND YIELD OF MUNGBEAN

[*(Vigna radiata* L.*)* Wilzeck]

Benjamin C. Agarcio, Jr.

Instructor, Department of Agronomy and Soil Science, Visayas State College of Agriculture, Baybay, Leyte.

Portion of MS thesis conducted by the author in UP at Los Banos.

Funded by the Philippine Council for Agriculture and Resources Research and Development.

ABSTRACT

A field experiment was conducted to evaluate the effect of row spacing and time of weeding on the competitiveness of mungbean against weeds.

Dry weed weight was generally higher at wider row spacing than at closer spacing because of more space available for weed growth.

Controlling weeds in mungbean within the first 4 weeks after seeding resulted in optimum yield. Weeds that emerged beyond 4 weeks after seeding were shaded out by the mungbean canopy and did not considerably reduce grain yield.

It appears that 2 timely weedings during the period of critical competition in mungbean could result in optimum yield comparable to that which can be obtained from season-long weeding.

Ann. Trop. Res. 5:83-90

KEY WORDS: Mungbean (*Vigna radiata* (L.) Wilzeck). Weeds. Row spacing. Time of weeding. Weed competition.

INTRODUCTION

Mungbean (*Vigna radiata* (L.) Wilzeck) is one of the most important grain legume crops in the tropics. It is a source of highly digestible protein and is usually free from flatulent effects associated with other legumes. The protein content is about 20-30%, almost 3 times that of cereals (Payumo, 1977).

Since mungbean is a valuable plant source of protein and an excellent substitute for the more costly animal source in the human diet, there is an obvious need for increasing the productivity of this crop. However, many factors have been identified to limit the growth of the crop, and weeds constitute one of the major problems in mungbean production.

Mungbean is not very competitive against weeds, thus, control of weeds is an essential and important activity in the culture of this crop. Yield losses in mungbean due to weeds are relatively high ranging from 77% during the dry season to 90% during the wet season (Castin et al., 1976). The magnitude of yield loss due to weeds is determined by the degree of competition which is influenced by row spacing (Cagampang et al., 1977) and method of weed control (Madrid, 1973).

The above findings suggest a need to develop integrated weed control schemes in mungbean. Information on the effects of row spacing and time of weeding on yield should eventually contribute to the development of suitable weed control approaches in mungbean. The ideal row spacing and appropriate time of weeding that would produce optimum yield of mungbean under Los Banos conditions were thus investigated in this study.

MATERIALS AND METHODS

The experiment was laid out in an area of 1,210 m^2 using the split-plot arranged in the randomized complete block design. Plot dimension was 3 m wide and 5 m long. Three row spacings namely; 25, 50 and 75 cm were assigned as the mainplots and 9 time of weeding treatments, i.e., 2, 4, 6, 2 + 4, 2 + 6, 4 + 6, 2 + 4 + 6, 2 + 4 + 6 + 8 weeks after seeding (weed-free control) and the unweeded control were assigned as the sub-plots. Each treatment was replicated 3 times.

Mungbean (var. CES ID-1) seeds were sown at a population of 400,000 plants per hectare. The inoculated seeds were drilled in furrows and covered with about 3-5 cm layer of soil. Plant populations of 10, 20 and 30 plants per linear meter for the 25, 50 and 75 cm spacings, respectively were maintained to achieve the desired population of 400,000 plants per hectare.

Blanket application of complete fertilizer at the recommended rate of 30-30-30 kg NPK/ha was done before planting. The actual amount of fertilizer applied was adjusted based on the result of soil analysis done by the Bureau of Soils – UPLB Applied Research and Extension Project.

Mungbean pods were primed twice at 65 and 68 days after seeding to gather the data on yield and yield components.

RESULTS AND DISCUSSION

Effect on Agronomic Characters of Mungbean

Leaf Area Index (LAI). Row spacing and time of weeding significantly affected LAI which was determined at early podding stage (Table 1). Higher LAI values were obtained in the 25 and 50 cm row spacings than in the 75 cm row spacing. On the other hand, LAIs of mungbean in plots maintained weed-free, weeded at 2 + 4 weeks after seeding (WAS), and weeded at 2 + 4 + 6 WAS were higher compared to the other weeding treatments. The reduction in LAI values in the later treatments was attributed to the

Table 1. Mean values of the different agronomic characters of mungbean as affected by row spacing and time of weeding.

Treatment	LAI	Plant Height (cm)	Effective Nodule Count	Plant Population/ m^2
Row spacing (cm)				
25	1.6a	58.4b	28.8a	35.1c
50	1.6a	58.9a	28.5a	36.8a
75	1.5b	58.9a	26.9b	35.8b
Time of weeding (weeks after seeding)				
2	1.5d	58.8bc	25.1c	37.7a
4	1.5d	58.2cd	28.6cd	38.2a
6	0.8e	59.9a	25.2c	33.6b
2 + 4	2.0a	58.6c	30.9b	38.0a
2 + 6	1.9b	58.2cd	29.9bc	37.9a
4 + 6	1.6c	59.6ab	27.1d	34.6b
2 + 4 + 6	2.0a	57.4e	33.4a	38.6a
Weed-free control (2+4+6+8)	2.0a	57.7de	34.5a	38.5a
Unweeded control	0.7f	60.0a	18.3f	26.2c
C. V. (%) a –	5.6	1.4	7.2	3.3
b –	4.7	2.0	7.0	5.4

In a column, means followed by a common letter are not significantly different at 5% level. Row spacing and time of weeding were considered separately.

adverse effects of weed competition and that the first 4 weeks of growth was the most critical stage of mungbean to weed competition. This finding conforms with that of Enyi (1973) wherein reduction in LAI of mungbean was due to weed competition.

Plant Height. Plant height was measured at maturity before priming was done. Taller plants were observed when mungbean was planted in rows 75 and 50 cm apart compared to 25 cm spacing (Table 1). This response can be attributed to competition for light. With the same plant density, wider row spacing would result in closer distance between plants within the row which indicates a more pronounced adverse effect of intra-row competition than inter-row competition.

Mungbean plants in unweeded plots and those in treatments subjected to prolonged weed competition were taller than those plants which competed with the weeds for a shorter time. This finding suggests that a higher

degree of intraspecific and interspecific crop-weed competition is expected when more plants are present per unit area.

Effective Nodule Count. The nodules from the lateral and tap roots were counted at early podding stage. The effective nodules were those that showed a reddish tinge when dissected and this was considered an indication of active nitrogen fixation (Iswaran, 1974).

More effective nodules were observed in plants at 25 cm (28.84 nodules/plant) and 50 cm row spacings (28.49 nodules/plant), suggesting that these spacings are optimum for nodule formation (Table 1). Iswaran (1974) mentioned that efficient symbiosis depends on the growth and metabolism of the host plant (legume). On the other hand, the effect of the weeding treatments on nodule formation indicated the necessity of effective weed control. Plants in plots maintained weed-free and those weeded within 4 weeks after seeding developed more nodules. This finding conforms with the observation of Iswaran (1974).

Plant Population. More productive plants were noted in 50 cm row spacing as compared to 75 and 25 cm spacings (Table 1). These differences in plant population at harvest resulted in significant variations in yield among the 3 row spacings used. This finding suggests that 50 cm row spacing is optimum for mungbean production.

At harvest, less productive plants were observed in the unweeded plots and in plots weeded at 6 WAS and at 4 + 6 WAS. More productive plants were obtained in weed-free plots (weeded at 2 + 4 + 6 + 8 WAS) and in plots where weeding was done within the first 4 weeks of growth. This observation indicates that the first 4 weeks was the critical period of crop-weed competition. It further shows the adverse effect of weed competition on mungbean when weeding is delayed.

Effect on Yield and Yield Components of Mungbean

Pods per Plant. Pod formation was not affected by row spacing but was influenced by time of weeding (Table 2).

Mungbean in plots handweeded at 2 + 4 WAS, at 2 + 4 + 6 WAS and at 2 + 4 + 6 + 8 WAS (weed-free control) developed more pods than in the other weeding treatments. Few pods per plant were produced in plots weeded at 2 WAS, 4 WAS, 6 WAS, and 2 + 6 WAS. Poor development and low production of pods in plots weeded at 2 WAS can be attributed to adverse competition effect caused by weed regrowth and late emerging weeds. Moreover, handweeding done at 4 WAS, 6 WAS, and 4 + 6 WAS must have been too late such that weeding operations during these periods were ineffective in minimizing the adverse effect of weed competition on mungbean.

Grains per Pod and Seed Weight (g). Grain formation and seed development were not influenced by row spacing (Table 2). On the other hand, time of weeding significantly affected

Table 2. Mean values of yield and yield components of mungbean as affected by row spacing and time of weeding.

Treatment	No. of Pods/Plant	No. of Grains/Pod	Weight of 500 Seeds (g)	Grain Yield (kg/ha)
Row spacing (cm)				
25	11.2	10.7	23.2	511.5b
50	11.4	10.3	22.9	565.0a
75	11.4	10.1	22.9	455.8c
Time of weeding (weeks after seeding)				
2	10.5e	10.1e	23.0	340.2f
4	11.4cde	10.6bc	22.9	487.7f
6	10.3e	9.2d	23.0	244.4g
2 + 4	12.2bc	11.8a	23.0	663.8bc
2 + 6	11.8cd	11.3ab	23.1	622.0cd
4 + 6	11.0de	9.3d	22.8	487.3e
2 + 4 + 6	13.0ab	11.7a	23.2	782.0ab
Weed-free control (2+4+6+8)	13.2a	11.6a	23.2	824.4a
Unweeded control	8.6f	7.9e	22.4	144.7h
C. V. (%) a–	9.4	7.6	5.5	5.1
b–	7.8	5.2	6.9	4.3

In a column, means followed by a common letter or without any letter are not significantly different at 5% level. Row spacing and time of weeding were considered separately.

grain formation but exhibited no effect on seed development.

Mungbean in plots handweeded at 2 + 4 WAS, 2 + 6 WAS, 2 + 4 + 6 WAS, and in plots maintained weed-free produced more grains per pod than in the other treatments. This suggests that weeds in a mungbean field should be controlled within the first 4 weeks of growth to enhance grain formation.

Grain Yield (kg/ha). Significantly higher grain yield was obtained in 50 cm row spacing (564.98 kg/ha) followed by 25 cm (511.46 kg/ha) and 75 cm (455.76 kg/ha) row spacings. It appears that 50 cm is the optimum row spacing for mungbean production (Table 2).

The yield response of mungbean to the time of weeding was apparent. Higher yields were noted in the weed-free control (824.40 kg/ha), in plots handweeded at 2 + 4 + 6 WAS (782.04 kg/ha) and at 2 + 4 WAS (663.85 kg/

Table 3. Mean values of weed count and dry weed weight as affected by row spacing and time of weeding.

Treatment	Weed Count/m^2 at Harvest	Dry Weed Weight (g/m^2)	
		At Weeding	At Harvest
Row spacing (cm)			
25	34.4b	98.1b	173.0b
50	35.1b	108.2b	184.5b
75	38.6a	117.4a	205.1a
Time of weeding (weeks after seeding)			
2	40.0b	59.7d	250.1b
4	35.2c	84.2c	204.2c
6	32.5cd	204.3a	193.8cd
2 + 4	34.6c	77.1cd	195.6cd
2 + 6	33.8cd	86.6c	178.9d
4 + 6	34.5c	171.6b	80.9c
Weed-free control (2+4+6+8)	12.4e	–	33.0f
Unweeded control	71.4a	–	378.2a
C. V. (%) a –	10.6	17.9	11.7
b –	9.4	20.2	9.4

In a column, means followed by a common letter are not significantly different at 5% level. Row spacing and time of weeding were considered separately.

ha). Handweeding at 2 WAS, 4 WAS, and 6 WAS resulted in low yield. Low yield of mungbean when handweeded only once at 2 WAS could be attributed to weed regrowth and late emerging weeds that grew after the termination of weeding as exhibited by more weeds present and heavier dry weed weights at harvest (Table 3). Handweeding done at 4 WAS, 6 WAS, and 4 + 6 WAS was too late to protect mungbean plants from the adverse effect of weed competition. This finding suggests that weed control in mungbean is most critical during the first 4 weeks of growth. Vigorous crop growth after this period greatly reduced weed regrowth and the growth of late emerging weeds.

The result indicates that mungbean needs only 2 timely weedings during the first 4 weeks of growth to produce yield comparable to that obtained from season-long weeding. Handweeding at 2 + 4 + 6 WAS and at 2 + 4 + 6 + 8 WAS (weed-free control) are relatively laborious and time-consuming.

Effect on Weed Count and Weed Weight (g)

The effects of row spacing and time of weeding on weeds were assessed using the data on weed count and weed weight. Weed samples were taken using a 1 m x 1 m quadrat. The prevalent weed species were *Rottboellia exaltata, Cyperus rotundus,* and *Commelina bengahalensis* with *R. exaltata* as the most predominant. The other minor weed species found in the area were counted regardless of species.

Weed Count at Harvest. More weeds were observed in the 75 cm row spacing than in the 50 cm and the 25 cm row spacings (Table 3). This is mainly due to greater space available for weed growth. As expected, more weeds were present in the unweeded control followed by plots handweeded at 2 WAS. The other weeding treatments gave comparable weed counts with the weed-free control having the lowest.

Weed Weights at Weeding Time and at Harvest. Dry weed weights were higher at 75 cm row spacing in both sampling times (Table 3). This could be attributed to more weeds at this planting distance.

When weeding was done at early crop growth, weed weight was significantly lower. However, as weeding was delayed, weed weights progressively increased. Furthermore, as the frequency of weeding was increased, less weeds and lower weed weights were noted. On the other hand, weed weights at harvest showed an increasing trend when weeding was done earlier (e.g. 2 WAS). There were more weed regrowths and late emerging weeds after weeding at 2 WAS, thus, supplementary weeding was needed to avoid the suppressive effect of weed competition.

LITERATURE CITED

CAGAMPANG, I. C., NADAL, A. M. and GODILANO, E. C. 1977. The performance of promising mungbean varieties planted after rice under different environments. *In* First Int. Symp. on Mungbean at UPLB. Shanshua, Taiwan. p. 70.

CASTIN, B. M., NADAL, A. M. and MOODY, K. 1976. The effect of different weed control practices on crop yield and weed weight in sole cropped and intercropped corn and mungbean. Paper presented at the 7th Annual Conf. Pest Contr. Counc. Phil., Cagayan de Oro City. 5-7 May 1976. 8 p.

ENYI, B. A. C. 1973. An analysis of the effect of weed competition on growth and yield attributes in sorghum, cowpea and green gram. J. Agric. Sci. 81: 449-453.

ISWARAN, V. 1974. A manual for proper use of inoculants and pelleting for legumes. Manila: Bu. of Plant Industry, Information Section. 176 p.

MADRID, M. T. 1973. Field screening of herbicides for weed control in mungbean. *In* Weed Sci. Report for 1972-1973. Dept. of Agron. UP at Los Baños. pp. 28-29.

PAYUMO, E. M. 1977. The potential of mungbean as a protein supplement for child feeding. *In* First Int. Symp. on Mungbean at UPLB. Shanshua, Taiwan. p. 45.