

Agronomic Response of Soybean Accession at Two Spacings

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Abstract. Superior plant varieties combined with proper plant management is the key to optimizing plant productivity. This study aimed to obtain information about the response of several soybean accessions to different spacings. The research was carried out in Banyuwangi research station in the 2019. The study used a split plot design 2 factors which was repeated 3 times. The main plot was the method of planting: (1). Double rows 2:1 = 50 cm x (30 cm x 15 cm) (2) Single row : spacing 30 cm x 15 cm. As sub-plots, 15 accessions of soybeans. Based on the productivity per hectare, there are six accessions that have the potential to produce seeds above 3 tons/ha. Plant height, internode length, number of branches, weight of planting seeds were influenced by differences in plant spacing. In the single row, which was characterized by longer stems and nodes. With double rows, the seed yield per plant was higher than single row.

Key words : soybean, accession, productivity, population

INTRODUCTION

During the 1918-2022 period, the Ministry of Agriculture released 114 superior soybean varieties. The yield potential of each variety varies from 1.0 t/ha – 3.8 t/ha. Each of these varieties has specific superior characteristics in addition to having high yield potential. The highest yield potential of the newest soybean variety is the Dega variety at 3.82 t/ha. In fact, in the field with various levels of maintenance, as well as the presence of biotic and abiotic stresses, the actual potential yield of seeds is only 50% of the actual potential yield [1]. So that the use of new superior varieties with yields of more than 3 t/ha or even above 4 tons/ha is becoming increasingly important in efforts to increase soybean productivity to support soybean self-sufficiency.

The strategy for increasing soybean yields can be approached through 5 sources of growth, namely increasing harvested area, increasing productivity, reducing yield gaps, increasing stability and reducing yield losses [11]. In particular, there are two ways to increase the productivity of soybeans, namely increasing the potential of plant genetic yields and improving crop management. Increasing the potential of plant genetic yields can be done by assembling superior varieties with high yields of more than 3 t/ha. The potential yield of existing plant genetics is relatively high up to 3.8 t/ha, but with poor plant management at the farmer level, the yield will be much lower, even up to 50% [1].

The potential genetic yield of soybeans in Bali and West Nusa Tenggara can theoretically reach 3.5 t/ha when calculated by the amount of dry matter production of soybeans and the intensity of sunlight [13]. The superior soybean varieties suggested by Sinclair [12] are those with a high yield index >50%. The increase in productivity in soybeans can be done with a strategy through the formation of new varieties of early maturity, efficient in the use of nutrients and high ability in N fixation [9].

Adisarwanto [2] reported that the number of plants harvested per hectare only ranged from 100-200 thousand plants so that productivity was varied and low. By using ideal soybean varieties with sturdy stems and slightly branched phenotypes and recommendations for an optimal plant population of 400-500 thousand plants per hectare, it can be increased to an optimal population of 400-500 thousand plants. so that the productivity of 3.5-4.0 t/ha can be achieved.

Soybean cultivation technology other than high quality seeds is nutrient and water management. Entisol soils in Central Java, East Java, Bali and NTB showed more than 75% had low to very low soil C-organic content, as well as low levels of N, K, and S [3]. To overcome this, fertilization with organic chicken manure 10-20 t/ha is highly recommended [6]. In Vertisol soil the application of chicken manure 20 t/ha can increase soil C-organic content and increase the efficiency of P fertilizer in soybean plants [7;8].

The increase in soybean productivity is not only by using new superior varieties with high yield potential but also by the application of proper cultivation. The productivity of some soybean varieties can exceed the yield potential if supported by proper crop management. This is as seen from the seed yield of several soybean varieties in the VUB dissemination activities that have been carried out by Balitkabi. The varieties Detam 4, Detam 3, Dena 1, Anjasromo and Demas 1 are capable of producing seeds above 4.0 t/ha [15].

The *jajar legowo* planting system, which is currently being developed for rice commodities, can be tried on soybeans. The *jajar legowo* (*tajarwo*) planting system is a cropping system that pays attention to the array of plants and is alternating planting between two or more rows of rice or soybeans and one empty row. The goal is that the plant population per unit area can be maintained and even increased [5]. In the 2:1 *legowo* planting method, every two rows of plants are interspersed with an empty row with a width of twice the row spacing, but the spacing in rows is narrowed to half the original spacing.

Based on the problems mentioned above, it is necessary to conduct research to determine the response and yield potential of several soybean accessions planted using different spacings.

MATERIALS AND METHODS

The research has been carried out in the rice fields of ILETRI riset station in Genteng, Banyuwangi Regency on 2019, planting on April 29 and harvesting in July-August 2019. The study used a 2-factor split plot design which was repeated 3 times. The main plot was the method of planting, namely: (1). How to plant Jajar legowo 2:1 = 50 cm x (30 cm x 15 cm) with 2 plants per hole (2) planting method with a spacing of 30 cm x 15 cm, 2 plants per planting hole. As sub-plots were 15 accessions of high yielding soybeans, namely: 1) MLGG 1109, 2) MLGG 1097, 3) MLGG 1099, 4) MLGG 1108, 5) MLGG 1092, 6) MLGG 1106, 7) MLGG 1185, 8) MLGG 1180, 9) MLGG 1081, 10) MLGG 1090, 11) MLGG 1152, 12) MLGG 1118, 13) MLGG 1133, 14) MLGG 1153, dan 15) MLGG 1124.

The land was cleared of weeds or previous crop residues, the land was treated lightly or without tillage. The plot size is 2.5 m x 4 m. A drainage 40 cm wide and 20 cm deep was made around the experimental plot. Before planting, the seeds are treated with an insecticide with the active ingredient theametoxyam to prevent seedling fly pests. Seeds were planted in a single method for: (1). How to plant *Jajar legowo* 2:1 with a spacing of = 50 cm x (30 cm x 15 cm), i.e. empty rows are 50 cm, the distance between rows of soybeans was 30 cm and the distance in rows was 15 cm, 2 plants per hole and (2) methods single row planting with a spacing of 30 cm x 15 cm, 2 plants per planting hole.

The plant population in double rows is equivalent to 325,000 plants per ha, while in single rows it is equivalent to 379,166 plants per ha. Fertilization for all planting methods using: manure 5 t/ha + NPK 200 kg/ha+ SP-36 100 kg/ha. All doses of SP-36 fertilizer and 50% doses of NPK fertilizer were applied at the same time as planting and 50% of the NPK fertilizer dose was given at 30 DAP by spreading evenly on each plot. Ameliorant in the form of 5 t/ha of manure was applied before planting by spreading it evenly on all experimental plots. Weeding was done twice. The first manual weeding

when the plants are 15-20 days after planting. The second manual weeding when the plants are 40-45 days old. Pest control was done chemically with insecticides according to the pests that attack. Harvesting was done when most of the pods are brown. How to harvest by cutting the stems as close as possible to the roots, after that the soybean stover is dried and seeded, then the seeds are dried in the sun to dry.

The soil in the research station was considered infertile based on the low Cation Exchange coefficient (CEC) (Table 1). The soil reaction (pH) of the soil was slightly acidic, the P₂O₅ content was very high, the K-dd status was low and the total soil N content was very low. Soil C content is low, as well as very low Na-dd content, Ca-dd, and Mg are in high category, while SO₄, Zn, Cu, Mn are low to very low but Fe content is very high. Low levels of organic C can be increased by giving organic fertilizers, as well as chemical elements that are classified as low, fertilization needs to be added. The fertilizers given were manure 5 t/ha and NPK fertilizer (200 kg/ha NPK and 100 kg SP-36).

During the study, it rained almost every month, with an average rainfall of 31.84 mm, the highest rainfall was in April at the time of early plant growth (Figure 1). Starting in May, the rain began to decrease, and during the growth of the plants, one irrigation was carried out.

Observations consisted of: Initial soil analysis (pH, C-Org, N, P, K, Na, Ca, Mg, SO₄, Fe, Zn, Cu, Mn, CEC). Soil was taken at a depth of 0-20 cm at 10 points then composited and taken as much as $\pm$ 1 kg and put into a plastic bag that had been coded and then analyzed for soil chemistry in the Lab. Soil. Percentage of plants growing at 15 DAP by counting the number of plants growing in each plot. Plant height in the R5 phase and at harvest by measuring the length of the plant from the base of the stem to the growing point. The dry weight of the plants at the R5 phase after harvest and at harvest, removed 4 plants and dried in the oven at 80°C for 48 hours or after constant weight was achieved. The intensity of sunlight which was measured at 35, 55 and 70 DAP, measured the intensity of sunlight above the canopy and under the canopy at 12.00 pm. Number of crops harvested, counting all crops harvested. Dry seed weight per plot, by drying the seeds to a moisture content of 12% yield per plot. Flowering age is calculated after 50% of the plants have flowered). The ripe age was calculated after 50% of the pods had physiologically matured. Observations of 20 harvested plants on the number of branches, number of filled pods, number of empty pods, weight of filled pods, dry weight of seeds, weight of 100 seeds and diameter of seeds at harvest.

Table 1. Chemical characteristics of soil before planting. Genteng, Banyuwangi, 2019

Properties	Method	value	Claasification
pH-H ₂ O	1:5	6,3	Slight acid
pH KCl	1:5	5,0	acid
N (%)	Kjedahl	0,08	Very low
P ₂ O ₅ (ppm)	Olsen	98,0	Very high
C-org (%)	W & Black	0,44	Low
C/N		5,5	Low
K-dd (cmol ⁺ /kg)	1 N NH ₄ OAc pH 7	0,31	Low
Na-dd (cmol ⁺ /kg)	1 N NH ₄ OAc pH 7	ND	Very Low
Ca-dd (cmol ⁺ /kg)	1 N NH ₄ OAc pH 7	14,27	High
Mg-dd (cmol ⁺ /kg)	1 N NH ₄ OAc pH 7	6,45	High
SO ₄ (ppm)	1 N NH ₄ OAc pH 4,8	ND	Very Low
Fe (ppm)	DTPA	63,62	Very high
Zn (ppm)	DTPA	ND	Very Low
Cu (ppm)	DTPA	ND	Very low

Mn (ppm)	DTPA	3,86	Low
KTK (cmol ⁺ /kg)	1 N NH ₄ OAc pH 7	13,81	Low

Soil chemical analysis in the Soil Lab. ILETRI. Malang

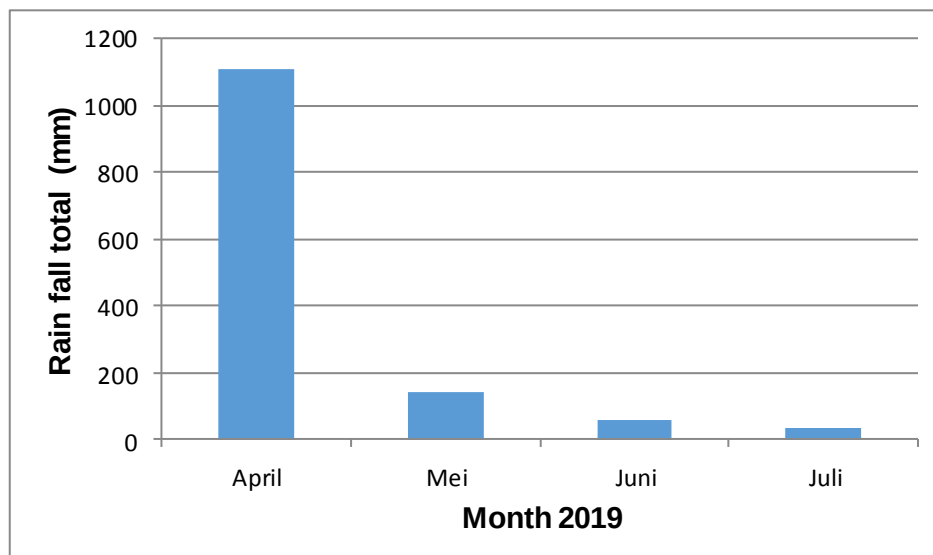


Figure 1. Rainfall during plant growth at Research station on Genteng, District of Banyuwangi, 2019.

RESULT AND DISCUSSIONS

Plant Growth and Light Intensity

Based on the results of statistical analysis, there was an interaction between planting distance and accession only on the variable of sunlight intensity under the canopy at 55 DAP (Table 2) and on plant height in the R5 phase (Table 3). In other growth variables such as the percentage of plants growing, the intensity of sunlight at 35 DAP and 75 DAP, dry weight and stem diameter in the R5 phase were not affected by the spacing or the accessions used. The plant accessions used had an effect on plant height, dry weight, flowering and maturity age (Table 3).

Table 2. Summary of the analysis of variance among the spacing and soybean accessions on the percentage of plants growing and the intensity of light. Genteng. Dry season 2019.

Source of variance	DF	Plant Stand	Light Intensity					
			35 DAP		55 DAP		75 DAP	
			Above Canopy	Under Canopy	Above Canopy	Under Canopy	Above Canopy	Under Canopy
Spacings (J)	1	ns	ns	ns	ns	ns	ns	ns
Accessions (A)	1	ns	ns	ns	ns	**	ns	ns
J*A	1	ns	ns	ns	ns	**	ns	ns
CV (%)		8,61	3,17	11,28	3,16	32,95	4,95	5,19

note: ns : not significant 0.05% level on F test, ** : Significant at 0.05% level on F test

Tabel 3. Summary of the analysis of variance among the spacing and soybean accessions on plant height, plant dry weight, internode length and flowering age and physiological maturity. Genteng. Dry season 2019.

Source of variance	DF	Plant Height on ..		Dry Weight on..		Diameter stem	Internode length	Ages	
		R5 phase	Harvest	R5 phase	Harvest	R5		flowering	physiological maturity
Spacing (J)	1	ns	**	ns	ns	ns	**	ns	ns
Accessions (A)	1	**	**	ns	**	ns	**	**	**
J*A	1	**	ns	ns	ns	ns	ns	ns	ns
CV (%)		13,59	9,40	26,54	14,78	12,65	10,50	4,84	2,04

note: ns : not significant 0.0 5% level on F test, ** : Significant at 0.05% level on F test

The percentage of plants growing at 15 DAP was not affected by the spacing or the accessions used. Percentage of growing plants ranged from 76-83% (Table 4). The intensity of sunlight was observed using a luxmeter above and below the plant canopy. When the plants were 35 days after planting, the intensity of sunlight above the canopy was around 1149-1202 lux and under the canopy it was around 734-897 (Table 4). At this time the plant canopy has grown well, however the soybean canopy has not covered the entire area. At the age of 55 days after planting, the intensity of sunlight under the canopy only ranged from 5.00-109 lux. The intensity of sunlight under the canopy at this time, accession MLGG 1153 with double spacing has the highest intensity of sunlight, followed by MLGG 1092, MLGG 1109 and MLGG 1099. In general, the intensity of sunlight under the canopy with a single spacing of 30 cm x 15 cm smaller than the double spacing (Table 5). At 75 DAP above the canopy, the intensity of sunlight ranges from 1197 to 1279, while under the canopy it ranges from 1130 to 1186 lux.

Table 4. Plant stand and light intensity among the different spacing and soybean accessions. Genteng. Dry season 2019

Treatment	Plant Stand	Light intensity (lux)				
	(%)	35 DAP		55 DAP	75 DAP	
		Above canopy	Under canopy	Above canopy	Above canopy	Under canopy
Spacing						
50cmx (30 x15 cm)	79,2	1173,4	795,4	1181,6	1200,1	1130,2
30 cm x 15 cm	81,1	1185,9	807,8	1194,5	1263,7	1192,3
Accessions						
1. MLGG 1109	81,6	1169,8	820,5	1178,2	1279,3	1145,3
2. MLGG 1097	76,6	1178,6	841,7	1186,2	1196,7	1142,7
3. MLGG 1099	80,0	1202,8	778,8	1209,7	1211,5	1140,5
4. MLGG 1108	77,5	1174,0	850,5	1180,5	1223,7	1154,7
5. MLGG 1092	77,5	1209,8	800,5	1219,5	1214,8	1163,3
6. MLGG 1106	81,6	1183,6	792,3	1193,0	1209,2	1168,5
7. MLGG 1185	83,3	1149,2	790,5	1156,8	1222,2	1178,3
8. MLGG 1180	78,3	1171,7	773,7	1180,5	1230,8	1137,5
9. MLGG 1081	80,0	1196,5	823,7	1205,5	1223,7	1138,8
10. MLGG 1090	80,3	1158,7	773,5	1167,8	1223,8	1158,8
11. MLGG 1152	82,5	1192,5	806,7	1201,5	1241,5	1172,3
12. MLGG 1118	80,8	1175,3	785,7	1183,8	1253,2	1183,2
13. MLGG 1133	80,8	1183,7	755,2	1190,8	1250,2	1176,7
14. MLGG 1153	80,0	1191,0	897,0	1199,5	1252,2	1171,8
15. MLGG 1124	80,8	1158,3	734,8	1167,3	1246,3	1186,3

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test.

Table 5. Intensity of sunlight under the canopy at 55 DAP fifteen soybean accessions at two different spacings. Genteng. 2019

Accessions	Spacings	
	50 cm x (30 cm x 15 cm)	30 cm x 15 cm)
1. MLGG 1109	29,66 bc	18,33 c
2. MLGG 1097	8,66 c	8,00 c
3. MLGG 1099	28,33 bc	13,33 c
4. MLGG 1108	23,00 c	9,00 c
5. MLGG 1092	54,66 b	20,00 c
6. MLGG 1106	11,33 c	5,00 c
7. MLGG 1185	7,66 c	6,33 c
8. MLGG 1180	7,33 c	8,66 c
9. MLGG 1081	10,66 c	6,33 c
10. MLGG 1090	13,00 c	7,66 c
11. MLGG 1152	25,00 c	7,00 c
12. MLGG 1118	12,33 c	8,66 c
13. MLGG 1133	12,33 c	4,00 c
14. MLGG 1153	109,66 a	24,66 c
15. MLGG 1124	14,33 c	5,66 c

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test.

The intensity of sunlight under the canopy at 55 DAP 15 soybean accessions at two spacings. Differences in spacing and accessions used affected plant height in R5 and harvest phases, plant dry weight at harvest, book length, flowering age and physiological maturity (Table 3). There was a tendency with the usual spacing of 30 cm x 15 cm, the plants grow relatively taller (Table 6) this is probably due to the influence of etiolation because the plant population is denser. At harvest time, it is known that plants that use a spacing of 30 cm x 15 cm have higher stem growth than the double row planting method of 20 cm x (30 cm x 15 cm). Meanwhile, different plant accessions caused plant height growth at harvest to vary between 44 cm – 77 cm (Table 7). Similarly, at harvest time, MLGG1180 accession produced relatively higher plant biomass than the other 7 accessions, while in the R5 phase the dry weight of the plant was 13-20 g/plant which was different.

Table 6. Plant height in the R5 phase of fifteen soybean accessions at two different spacings. Genteng. 2019

Accessions	Spacings	
	50 cm x (30 cm x 15 cm)	30cm x 15 cm

1. MLGG 1109	51,5 gh	53,0 f-h
2. MLGG 1097	66,2 a-g	52,2 f-h
3. MLGG 1099	64,0 b-g	65,3 a-g
4. MLGG 1108	56,3 e-h	66,8 a-g
5. MLGG 1092	69,6 a-f	72,1 a-e
6. MLGG 1106	71,2 a-e	63,7 b-g
7. MLGG 1185	76,9 a-c	61,2 c-g
8. MLGG 1180	63,9 b-g	76,7 a-c
9. MLGG 1081	80,3 ab	71,1 a-e
10. MLGG 1090	58,4 d-g	82,7 a
11. MLGG 1152	64,9 a-g	80,4 ab
12. MLGG 1118	71,2 a-e	77,6 a-c
13. MLGG 1133	71,6 a-e	72,0 a-e
14. MLGG 1153	39,7 h	54,0 e-h
15. MLGG 1124	64,6 b-g	76,2 a-d

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test..

Table 7. Plant height at harvest and plant dry weight in fifteen soybean accessions at two different spacings. Genteng. 2019

spacings: Genteng, 2015			
Treatments	Plant Height (cm)	Dry weight of biomass (g/plant)	
		R5	Harvest
Spacings			
50 cmx (30 x15 cm)	65,2 B	16,6 A	29,3 A
30 cm x 15 cm	67,8 A	16,0 A	27,5 A
Accessions			
1. MLGG 1109	52,4 g	15,4 a	19,0 g
2. MLGG 1097	60,3 ef	17,4 a	32,6 ab
3. MLGG 1099	65,6 c-e	16,3 a	26,2 c-f
4. MLGG 1108	56,9 fg	18,1 a	30,4 a-d
5. MLGG 1092	71,2 a-d	17,3 a	30,3 a-d
6. MLGG 1106	73,4 a-c	16,7 a	25,2 d-f
7. MLGG 1185	73,7 a-c	15,4 a	28,2 b-e
8. MLGG 1180	64,2 d-f	20,4 a	33,9 a
9. MLGG 1081	72,6 a-c	15,4 a	33,3 ab
10.MLGG 1090	77,0 ab	13,8 a	30,5 a-d
11.MLGG 1152	66,3 c-e	15,9 a	31,3 a-c
12.MLGG 1118	77,2 a	14,9 a	33,1 ab
13.MLGG 1133	72,2 a-d	16,3 a	24,3 ef
14.MLGG 1153	44,5 h	16,3 a	26,3 c-f
15.MLGG 1124	69,0 b-d	17,6 a	21,2 fg

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test.

The difference in spacing used and the 15 soybean accessions tested did not affect plant growth size/stem diameter (Table 8). It is suspected that the usual 30 cm x 15 cm spacing affects the internode size (internode length), which is longer than the legowo row spacing or possibly due to etiolation. MLGG 1106 has a relatively longer internode length compared to other accessions

Flowering age was only affected by differences in the accessions used. Flowering age ranges from 29 -33 days. For the maturity age of the pods, the differences obtained were due to differences in the accessions used. Accession MLGG 1192 had the longest maturity age of 93 days, compared to other accessions (Table 8).

Table 8. Stem diameter, internode length, flowering and ripening age of fifteen soybean accessions at two different spacings. Genteng. 2019

Treatments	Stem diameter	Internode lenght	ages	
	(mm)	(cm)	flowering	harvest
Spacings				
50cmx (30 x15 cm)	4,5	5,2 B	32,1 A	82, 3 A
30 cm x 15 cm	4,9	5,3 A	32,1 A	83,0 A
Accessions				
1. MLGG 1109	4,4	5, 3 b-d	29,0 e	74,7 h
2. MLGG 1097	4,6	4,3 e	31,8 bcd	88,0 b
3. MLGG 1099	4,9	5,7 ab	30,0 de	76,2 b
4. MLGG 1108	5,1	4,6 de	34,0 a	86,3 bc
5. MLGG 1092	4,9	4,8 c-e	32,5 abc	93,0 a
6. MLGG 1106	4,7	6,0 a	31,3 cd	76,7 gh
7. MLGG 1185	4,8	5,5 a-c	32,2 abc	81,3 f
8. MLGG 1180	4,6	4,8 c-e	33,3 abc	82,8 ef
9. MLGG 1081	4,5	5,4 a-d	33,2 abc	83,7 de
10.MLGG 1090	4,5	5,4 a-d	33,5 ab	85,3 cd
11.MLGG 1152	4,7	5,1 b-d	32,3 abc	82,7 ef
12.MLGG 1118	4,7	5,7 ab	31,3 cd	83,2 ef
13.MLGG 1133	4,8	5,8 ab	32,2 abc	76,8 g
14.MLGG 1153	4,8	4,8 c-e	32,5 abc	93,0 a
15.MLGG 1124	4,8	5,6 ab	32,3 abc	76,0 gh

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test.

Yield and Component Yield

Based on statistical analysis, it was known the interaction between spacing and soybean accession on the number of branches at harvest (Table 9). Plant spacing and accessions used affected the number of filled and empty pods, dry weight of filled pods, dry weight of planted seeds, dry weight of 100 seeds, productivity and seed diameter.

The number of filled pods was only affected by the differences in accessions evaluated. The most filled pods in MLGG 1183 were 54 pods planted. In the variable number of empty pods, it was known that the highest number of empty pods was in MLGG 1192 and MLGG 1106 accessions. The largest seed diameter was in MLGG 1109 as much as 7.71 mm. In the variable number of main branches at harvest, accessions MLGG 1108 had 3.5 branches, while MLGG 1152 and MLGG 1118 had only 1.5-1.7 branches.

The seed yield component that was affected by the spacing only occurred in the dry weight of the seeds, namely with a double row spacing of 50 cm x 30 x 15 cm, the dry weight of the seeds was higher than the spacing of 30 cm x 15 cm. This condition, as described in the *jajar legowo* planting system, will make all plants or more plants become edge plants. Edge plants will get more sunlight with better air circulation, and plants will get better nutrients than the single row planting method [16]. The higher plant population in the *jajar legowo* planting system provides an opportunity to get high yields. Variety performance at wide spacing (40 cm x 40 cm) differs in the number of panicles compared to dense spacing [14]. Root competition in water and nutrient absorption allows the selection of plant varieties that are able to tolerate drought stress or that are adaptive to soils with low fertility. According to Masdar et al. (2005) the use of a spacing of 30cm x 30cm significantly increased the yield and yield components of rice compared to the spacing of 20cm x 20cm and 25 cm x 25 cm. Using a wide spacing will increase the capture of solar radiation by the plant canopy which further increases plant growth, but has no effect on yield per unit area [4].

The dry weight of 100 seeds and plant productivity were only affected by the plant accessions tested (Table 12). With the double row arrangement, the yield of seeds was higher than the single row, although the yield per hectare was not significantly different between the spacing treatments. Accession MLGG 1109 had the largest seed size reaching 23.26 g/100 seeds, while the smallest seed size in accession MLGG 1183 was 11.64g. Crop productivity is only affected by differences in the accession of soybeans grown. If the minimum productivity criterion of 3.0 t/ha is used, six accessions have the potential to obtain productivity above 3.0 t/ha, namely: MLGG 1192, MLGG 1180, MLGG 1081, MLGG 1152, MLGG 1118 and MLGG 1153.

Table 9. Summary of the analysis of variance among the spacing and soybean accessions on yield and component of yield. Genteng. Dry season 2019.

Source of variance	DF	Number				Dry weight		Yield		
		Plant of harvest	branch	Pod Filled	Empty pod	Pod	seed per plant	100 seeds	t/ha	Diameter of seed
Spacings (J)	1	tn	**	tn	tn	tn	**	tn	tn	tn
Accessions (A)	1	tn	tn	**	**	**	**	**	**	**
J*A	1	tn	**	tn	tn	tn	tn	tn	tn	tn
KK (%)		18,08	25,61	14,20	14,66 ¹⁾	16,77	23,45	7,13	14,45	3,34

note: ns : not significant 0.0 5% level on F test, **: Significant at 0.05% level on F test

Table 10. Yield components of fifteen soybean accessions at two different spacings. Genteng. Dry seasons 2019

Treatments	Number of			
	Plant harvest	Filled pod	Empty pod	Diameter of seed (mm)
spacings				
50 cmx (30 x15 cm)	218,53	40,4	0,37	7,07
30 cm x 15 cm	237,04	38,3	0,52	7,03
Accessions				
1. MLGG 1109	223,2	24,2 j	0,65 b	7,71 a
2. MLGG 1097	214,0	47,4 abc	0,28 d	6,75 f
3. MLGG 1099	189,5	36,2 e-h	0,56 b	7,20 bc
4. MLGG 1108	203,8	42,3 b-e	0,36 bcd	6,80 ef
5. MLGG 1092	246,2	39,5 d-g	1,20 a	7,08 b-e
6. MLGG 1106	217,8	34,8 f-i	1,17 a	7,11 bcd
7. MLGG 1185	221,0	54,0 a	0,27 bcd	6,18 g
8. MLGG 1180	222,3	42,4 b-e	0,10 cd	7,31 bc
9. MLGG 1081	233,0	45,8 bcd	0,27 bcd	7,03 c-f
10. MLGG 1090	240,8	48,5 ab	0,08 d	6,83 def
11. MLGG 1152	220,8	40,9 c-f	0,08 d	7,35 b
12. MLGG 1118	228,5	42,8 b-e	0,10 cd	7,10 bcd
13. MLGG 1133	238,7	29,9 h-j	0,62 b	7,17 bc
14. MLGG 1153	260,8	28,3 ij	0,50 bc	7,30 bc
15. MLGG 1124	256,3	32,8 g-i	0,41 bcd	6,83 def

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test..

Table 11. The number of branches is fifteen soybean accessions at two different spacings. Genteng. Dry seasons. 2019

Accessions	Spacings	
	50 cm x (30 cm x15 cm)	30 cm x 15 cm)

1. MLGG 1109	1,7 fgh	3,1 a-d
2. MLGG 1097	2,1 b-h	3,3 ab
3. MLGG 1099	2,2 b-h	2,5 a-h
4. MLGG 1108	3,5 a	2,4 a-h
5. MLGG 1092	2,0 c-h	1,8 e-h
6. MLGG 1106	1,9 d-h	2,2 b-h
7. MLGG 1185	3,2 abc	3,2 abc
8. MLGG 1180	2,2 b-h	2,6 a-h
9. MLGG 1081	2,5 a-h	1,7 gh
10. MLGG 1090	3,0 a-e	2,6 a-h
11. MLGG 1152	2,0 c-h	1,7 h
12. MLGG 1118	2,2 b-h	1,5 h
13. MLGG 1133	1,7 gh	2,7 a-h
14. MLGG 1153	3,1 abc	2,8 a-g
15. MLGG 1124	2,9 a-f	2,5 a-h

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test..

Table 12. Yield and seed yield components of fifteen soybean accessions at two different spacings.
Genteng. Dry seasons. 2019

Treatments	Dry weight			Yield (seed moisture 12%)* t/ha
	Filled pod (g)	Seed per plant (g)	100 of seeds (g)	
Spacings				
50 cmx (30 x15 cm)	23,10	15,54 A	18,15	2,92
30 cm x 15 cm	21,48	14,204 B	18,02	2,80
Accessions				
1. MLGG 1109	15,92 e	10,16 f	23,26 a	2,53 de
2. MLGG 1097	25,33 a	17,25 a-d	16,33 gh	2,77 a-e
3. MLGG 1099	20,64 a-d	13,49 c-f	19,34 bc	2,67 b-e
4. MLGG 1108	23,64 abc	15,40 a-e	17,24 efg	2,82 a-e
5. MLGG 1092	24,58 ab	13,89 b-f	18,93 cd	3,15 ab
6. MLGG 1106	20,22 b-e	13,06 d-f	18,41 c-f	2,39 e
7. MLGG 1185	21,7 a-d	14,57 a-f	11,64 i	2,55 de
8. MLGG 1180	25,8 a	18,96 a	18,87 cde	3,18 ab
9. MLGG 1081	25,7 a	17,99 abc	17,55 d-f	3,11 a-e
10. MLGG 1090	23,6 abc	16,53 a-e	15,43 h	2,89 a-e
11. MLGG 1152	24,6 ab	14,88 a-e	19,38 bc	3,07 a-d
12. MLGG 1118	24,6 ab	18,59 ab	18,02 c-f	3,15 ab
13. MLGG 1133	19,10 cde	12,15 e-f	18,97 cd	2,56 cde
14. MLGG 1153	21,64 a-d	14,31 a-f	20,73 b	3,25 a
15. MLGG 1124	16,96 de	11,79 ef	17,13 fg	2,91 a-e

Note : numbers in same column with same letter means no significant difference according to DMRT 5% test.

CONCLUSIONS

Plant height, internode length, number of branches, weight of planting seeds were influenced by differences in plant spacing. In the single row, there was an etiolation effect which was characterized by longer stems and nodes. With double rows arrangement, the seed yield per plant was

higher than single row. Obtained six accessions that have the potential to produce seeds above 3 t/ha in both planting methods namely: MLGG 1192, MLGG 1180, MLGG 1081, MLGG 1152, MLGG 1118 and MLGG 1153.

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