PROCEEDINGS

The 7th ACSA Conference

The 7th ASIAN CROP SCIENCE ASSOCIATION CONFERENCE

Improving food, energy and environment with better crops

IPB International Convention Center
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Productivity of Several Lines of Soybean in Majalengka, West Java, Indonesia

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Abstract

Soybean (*Glycine max* L. Merr) is a very important crop in Indonesia. The creation of new elite varieties is one approach to increase the national production of soybean. We have developed several potential lines of soybean to be released as a new varieties. Before releasing as new varieties, the productivity of these lines has to be evaluated in several locations. Therefore the objective of this research was to evaluate the productivity of six lines of soybean resulted from the cross between Slamet and Nokonsawon varieties, i.e. KH8, KH9, KH31, KH38, KH55, and KH71 in Majalengka, West Java, Indonesia. Four national elite varieties i.e. Anjasmoro, Slamet, Tanggamus and Wilis were used as standard. The experiment was conducted in two seasons by using randomized block design, with three blocks as replication. The result showed that based on the seed production per plant in two seasons, all six lines have higher productivity than Anjasmoro variety. The seeds of these six lines are bigger than that of standard varieties. Analysis of production stability in two seasons showed that KH71 is the most stable genotype in Majalengka. By comparing to Anjasmoro variety in two seasons, all six lines have a potential to be released as new varieties with high productivity and big seed.

Keywords: lines, productivity, seed size, soybean

Introduction

Soybean (*Glycine max* L. Merr) is a very important crop in Indonesia. Every year, Indonesia imports more than 1.2 million tons of grains of soybean for food. The creation of new elite varieties is one approach to increase the production of soybean in Indonesia. The creation of tolerant varieties to acid soil containing high concentration of aluminum is very important to extend the cultivation onto the marginal land with with this condition. Sunarto (1995) had created a variety of Slamet which is tolerant to acid soil. Eventhough variety of Slamet has a high productivity and is a tolerant to acid soil, it has a relatively small seeds and its hilum is black which are undesirable traits for tofu and tempeh industry. To improve these traits, we had crossed this variety with Nokhonsawon variety which has a big seeds, then followed by selection based on high productivity and seed size traits (Suharsono *et al.*, 2006, 2007; Jambormias *et al.*, 2011). From this cross, we obtained 18 potential lines to be released as a new variety.

Before releasing a line of soybean as new variety, the productivity of this line has to be evaluated in several locations. In this experiment, six of 18 potential lines of soybean were cultivated in the irrigated rice field in Majalengka, West Java, Indonesia. Majalengka is a center of soybean production in West Java. So, the objective of this research was to evaluate the productivity and seed size of six lines, i. e. KH 8, KH 9, KH 31, KH 38, KH 55, and KH 71, with four elite national varieties, i. e. Anjasmoro, Slamet, Tanggamus, and Wilis as standard in two seasons in Majalengka, West Java, Indonesia.

Materials and Methods

Six lines of soybean i.e. KH8, KH9, KH31, KH38, KH55, and KH71 were used in this experiment. Four national cultivars i.e. Slamet, Wilis, Anjasmoro and Tanggamus were used as standard. The experiment was carried out in Randomized Block Desain with three replications, so this experiment had 30 experimental units or plots. The size of plot is 4 m x 5 m, planting distance is 40 cm x 20 cm with two plants per hole, so the productivity per hectar is productivity per plant x 250,000. The plants were fertilized by 10 tons of manure, 100 kg urea, 150 kg SP3, and 100 kg KCl per ha in the beginning of cultivation. The evaluation of plant productivity was carried out by sampling. For sampling, 10 plants were ramdomly chosen per plot. Seed size was mesured by weighing 100 dry seeds which were ramdomly chosen.

The cultivation was carried out in two seasons, i. e. wet and dry seasons. The cultivation in wet season (season I) was caried out in December 2009 - March 2010, and in dry season was done in May - August 2010. The data of seed productivity per plant and seed size were analyzed by Duncan Multiple Range Test. The clustering of genotype based on seed productivity per plant and seed size was carried out by Important Performance Analysis (IPA). The analysis of stability of seed productivity in two season was carried out by Additive Main Effect Multiplicative Interaction (AMMI).

Results and Discussion

Seed productivity and seed size

The seed productivity of all genotype (KH lines and standard varieties) in the wet season was very high, between 22.9 and 35.6 g per plant, equivalent to 5.7-8.9 tons per ha. This productivity is higher than that in dry season that is between 15.35 and 20.45 g per plant equivalent to 3.8- 5.1 tons per ha (Table 1). Based on the description of Ministry of Agriculture (Deptan, 2011), the productivity of Anjasmoro, Slamet, Tanggamus, and Wilis is 2.25-2.3, 2.26, 1.22, and 1.6 tons per ha respectively. This productivity is lower than that of the same variety in Majalengka that is more than 5 tons per ha (Table1). This result indicates that the environment of cultivation in Majalengka was very favorable for soybean. The soil of this experiment has a pH 5.9 and contains 65,3 ppm of P which are very favorable for soybean growth.

Table 1. The productivity of several genotype in wet and dry seasons

Genotype	Productivity in wet season		Productivity in dry season		Average of Productivity	
	g/plant*	kg/ha	g/plant*	kg/ha	g/plant	kg/ha
KH8	24.74 ab	6,185	17.7 ab	4,425	21.22	5,305
KH9	30.58 bc	7,645	20.45 c	5,113	25.52	6,380
KH31	22.89 a	5,723	19.02 bc	4,755	20.96	5,240
KH38	29.36 b	7,340	19.43 bc	4,858	24.4	6,100
KH55	35.62 c	8,905	17.71 ab	4,428	26.67	6,668
KH71	30.27 bc	7,568	17.06 ab	4,265	23.67	5,918
Anjasmoro	23.43 a	5,858	17.30 ab	4,325	20.37	5,093
Wilis	29.64 b	7,410	16.19 a	4,048	22.92	5,730
Tanggamus	30.56 bc	7,640	15.35 a	3,838	22.96	5,740
Slamet	24.74 ab	6,185	15.42 a	3,855	20.08	5,020

*the number followed by the different letter in the same column is significantly different.

Comparing to Anjasmoro which is elite national variety, all lines have equal or higher productivity in wet and dry seasons. This result indicates that all lines have a potential as elite

national variety with a potential yield more than 5 tons per ha. In wet season, KH55 line has a highest productivity, and in dry season KH9 has a highest productivity.

If we compare between wet and dry seasons, all genotypes have a higher yield in wet season than in dry one. In this experiment, the precipitation during wet season in Majalengka was about 411,53 mm/month, and during dry season was about 202 mm/month. Based on Calvino & Sadras (1999), the precipitation more than 300 mm/month is better for production of soybean.

In average, all lines and Anjasmoro variety have a big seed, and bigger than the seeds of Wilis, Tanggamus and Slamet varieties (Table 2). The big size is very important in the production of tofu because the rendement is depend on the endosperm, and the endosperm of bigger seeds is bigger than small ones. So, based on the size of seeds, all lines have a potential to be released as a big seed varieties. As the yield, the size of seeds was also bigger in the wet season than that in dry ones. The size of seeds may be affected by the enironment of growth. KH31 and KH38 have bigger seeds compared to other genotypes.

Table 2. The size of seed of several genotype in two seasons

Genotype	Size of seed (g/100)		
	Wet season	Dry season	Average
KH8	21.76 e	16.80 bcd	19.28
KH9	22.88 e	15.50 b	19.19
KH31	21.71 e	19.50 e	20.61
KH38	22.82 e	18.46 cde	20.64
KH55	19.00 bc	16.03 b	17.52
KH71	20.74 de	18.70 de	19.72
Anjasmoro	18.50 c	16.60 bc	17.55
Wilis	14.42 ab	10.83 a	12.63
Tanggamus	12.60 a	10.76 a	11.68
Slamet	15.42 b	12.30 a	13.86

Clustering of genotype

In wet season, except KH31 line, other lines have higher seed productivity and seed size compared to Anjasmoro variety. In dry season, KH8, Kh31 and KH38 lines have higher productivity and seed size compared to Anjasmoro variety (Figure 1). This result indicated that KH8 and KH38 lines are consistently better than Anjasmoro variety.

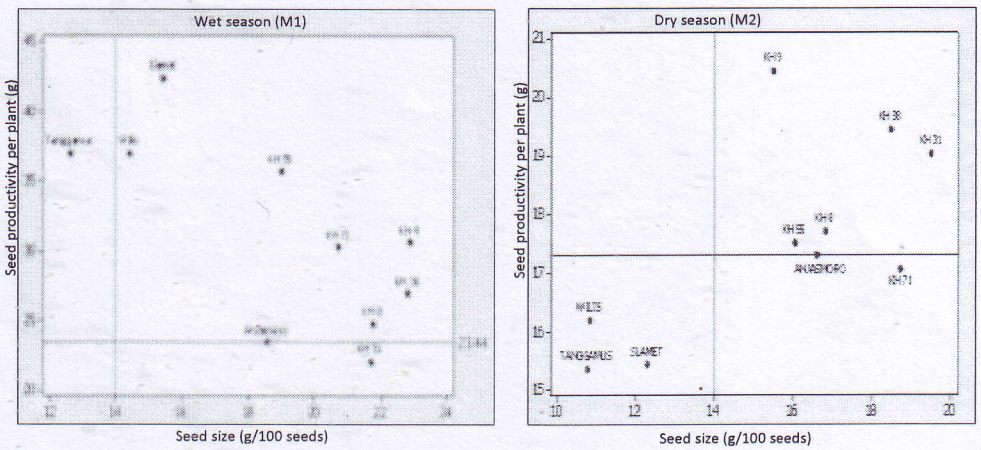

Figure 1. Clustering genotype of soybean based on seed productivity and seed size in wet and dry seasons.

Analysis of stability of seed productivity in two seasons showed that KH71 is the most stable genotype in Majalengka. KH9, KH38 and KH55 lines were more stable than Anjasmoro variety in wet and dry seasons than Anjasmoro Variety (Figure 2). If we consider to the seed productivity, the size of seeds and the stability of seed productivity, KH38 and KH71 are a potential lines to be developed to become elite national varieties.

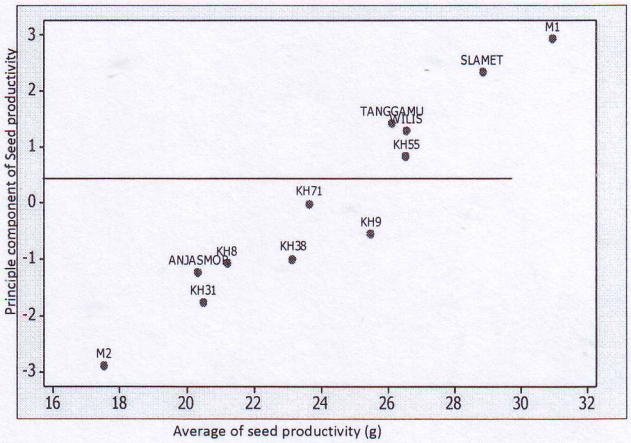

Figure 2. Stability of seed productivity in wet and dry season of soybean in Majalengka. M1= wet season, M2= dry season.

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