EVALUATION OF VEGETATIVE AND REPRODUCTIVE CHARACTERS OF F2 GENERATION OF YARD LONG BEANS (*Vigna sinensis* L.) FROM A CROSS BETWEEN A GREEN-SWEET POD AND RED POD PARENTS

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ABSTRACT

High yielding varieties can be obtained from a cross between two parental genotypes. This cross will result in variance in progeny population. This study aimed to look at the variance and broad sense heritability. Eighty individual plants in F_2 population from a cross between a green-sweet pod and red pod parent and the two parental genotypes (20 plants per parent) were planted in experiment station at The University of Lampung, Bandar Lampung, in December 2015. The results showed that the genetic and phenotypic variances of vegetative characters were found to be high in plant height and number of leaves but low in number of of branches. Genetic and phenotypic variances of generative characters were found to be high in number of flowers, number of pods per plant and pod length, but low in flowering date, number of seeds per pod, weight of 100 seeds, the level of crispness, and sweetness. Broad sense heritability all of the characters was high except the character of number of branches in the vegetative phase which was moderate. Two genotypes were found to have ideal characters.

Keywords: crosses, genetic, heritability, variance,

INTRODUCTION

Yard long beans (*Vigna sinensis* L.) have a very high potential to be developed. One way of increasing its production and quality is by breeding which could start with hybridization. Crosses could result in genetic variability the progenies and could be used to produce

homozygous expected lines which form the basis for the development of new varieties with novel agronomic characters (Barmawi , 2007). In yard long beans, A cross between green-pod parents that have stripes on the seed coat and red pod parent is expected to produce superior genotypes with red pods which are sweet and crispy, some important characteristiscs that meet consumers' demand (Ardian *et al.,* 2016)

An F2- generation is the highest segregated population because it consists of dominant and recessive homozygous genotypes, 50 % each. High percentage of heterozygote is derived from two parents that have their respective advantages (Fehr , 1987). This allows to expect a high variability in population which is expected to produce the best individuals out of the population. We expected to obtain superior individuals from a cross between green-sweet-pod and red-pod yard long bean. This study aimed to look at the variance and broad sense heritability and also obtain novel characters of individual progeny.

MATERIALS and METHODS

Eighty plants of an- F_2 population from crosses between green-sweet pod and red pod parental genotypes and the two parents (20 plants per parent) were grown in experiment station at the University of Lampung, Bandar Lampung, in December 2015. Variables observed were plant height, leaves number, branch number, flowering date, flower number, pod number per plant, pod length, seed number per pod, weight of 100 seeds, and the level of crispiness and sweetness.

RESULTS AND DISCUSSION

In this study, characters that had high variability and high broad sense heritability were plant height, leaves number, flower number, pod number per plant and pod length. The results were consistent with those reported by Sa'diyah *et al.* (2009), Barmawi *et al*. (2013), Ardian *et al.* (2016), Kuswanto (2006), and Jameela (2014). Sa'diyah (2009) reported that in F_3 population of yard long bean derived from a cross between black and striped black testa parents, variables showing high variability and heritability were plant height, leaf number, flower number, and pod length. Jameela (2014) reported that in the F_2 population of *Phaseolus vulgaris* L. from crosses

between introduction variety and local varieties, pod number per plant had high genetic variability and heritability. Kuswanto (2006) reported that in the F_2 population of a cross between PS and MLG 15151 yard long bean, pod number, pod weight per plant and harvest age had high variability and heritability.

High variability allows easier selection for desirable characters. High number of leaves were correlated with high photosynthetic rate in plants. The high rate of photosynthesis would result in accumulated fotosinthate. Fotosinthate accumulation would expectedly increase production and the sweetness of pods. In most plants , the photosynthetic activity of source and the development of sink are in a straight line, in which there is a balance between supply of carbohydrates produced from source (leaves) and filling activity of sink (pods). Sink's filling depends on the process of photosynthesis and carbon status on the organ source. Photosynthesis in source will provide feedback in the form of product accumulation of carbohydrates in the sink (pods) (Mc Cormick et al, 2007).

More number of flower is expected to produce more pods. The more pods are produced, the higher production are reached. A high yield also results from pod length. The higher the variability of pod length pod, the easier selection process is to adjust with consumer tastes. This will be a positive influence on the selling value of yard long beans. According to Budiarti (2011) the size of potential fruit is not necessarily longest or biggest one, but it should also have other characters desired by consumers. According Soetiarso (1996) in Ameriana (1998) the value of household consumer preference towards pod length is moderate (40-60 cm).

Characters of branch number, flowering dates, seed number per pod, weight of 100 seeds, level of crispness and sweetness showed a low variability. All of the characters, except brance number, showed high heritability in the broad sense. Criteria of variability and heritability in a broad sense in the F_2 population from crosses between green pods sweetness x red pods can be seen in Table 1 and Table 2.

Some individual genotypes have been selected on the basis of plant height, leaf number, level of sweetness, pod color, pod length and pod number per plant. Selection of plant height and leaf number was expected to increase the rate of plant physiology (Mc. Cormick, 2007).

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Vol. 1

Selection of level of sweetness, pod color, pod length and pod number per plant was expected to result in high yielding superior genotypes which has red pods. The red color in pod was caused by anthocyanin that act as antioxidants (Ginting, 2011). The individual genotypes exhibiting ideal characters which were selected are genotype numbers 59 and 30 (Table 3).

Table 1. Variability criteria of genotype and phenotype in the F_2 population from a cross between green-sweet pod and red pod parental genotypes of yard long bean.

Character	Genotype variance (σ_g^2)	Standard deviation (σg)	Phenotype variance (σ_f^2)	Standard deviation (σf)	Criteria
Plant height	27778,02	166,67	27910,73	27910,73	High
Number of leaves	73,63	8,58	167,07	167,07	High
Number of branches	1,77	1,33	80,99	80,99	Low
Flowering date	2,59	1,61	3,92	3,92	Low
Number of flower	67.44	8.21	73.04	8.55	High
Number of pods per plant	17.00	4.12	23.65	4.86	High
Pod length	26.64	5.16	29.74	5.45	High
Number of seeds per pod	1.26	1.12	2.21	1.49	Low
Weight of 100 seeds	2.91	1.71	3.81	1.95	Low
Level of crispness	0.18	0.43	0.30	0.55	Low
Level of sweetness	0.16	0.40	0.31	0.56	Low

Table 2. Heritability in a broad sense in the F_2 population from a cross between green-sweet pod and red pod parental genotypes of yard long bean.

Character	Heritability	Criteria
Plant height	0,99	High
Number of leaves	0,91	High
Number of branches	0,48	Intermediate
Flowering date	0,66	High
Number of flower	0.92	High
Number of pods per plant	0.72	High
Pod length	0.89	High
Number of seeds per pod	0.57	High
Weight of 100 seeds	0.76	High
Level of crispness	0.62	High
Level of sweetness	0.52	High

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Table 3. Selected individual genotypes in F2 population between green-sweet pod and red pod parental genotypes of yard long bean.

Rank	Genotype number	Character					
		Plant Height	Number of leaves	Level sweetness	Pod color	Number of pods per plant	Pod length
1	59	31	53	5.6	53A	25	67.3
2	30	35	35	5.4	53A	18	58.3

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