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Individual Selection in Two Population of Segregation Based on Yield and Yield component

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Abstract*— Wheat became an important cereal crops plant lately. Grain consumption increase year by year and it is covered by import. Now, government concern to the research and development of wheat in Indonesia. This research was carried out September 2012 to January 2013 in Nagari Alahan Panjang, sub-district of Lembah Gumanti, The district of Solok, West Sumatra Province. The purpose of this research was to select some plants in each population based on yield and yield component, in order to improve their characters in the next generation of plant. The research used two F2 populations (F2-1 and F2-2) derived from Slovakia and Selayar as a local variety. Each population F2 was planted as many as 240 seeds in two beds and Selayar in one bed consist of 120 seeds. Observations was done on spike length, number of productive tillers, number of spikelet and yield. The result showed that broad sense heritability of those characters was high. There were 16 plants selected from F2-1 population and 14 plants selected from F2-2 population which have productive tillers more than 35. Hence, Spike length has a correlation with yield. Both of F2 population selected individual plants whose spike above 11 cm. Therefore, it was selected 14 plants in F2-1 and 10 plants in F2-2. Spikelet number of spike influence the yield so that selection based on it will be important. In F2-1 population, it was selected 11 plants having more 25 spikelet numbers. On the other hand, it was selected 24 plants in F2-2 population having more than 20 spikelet numbers. The everage yield (grain weight) of these populations was different. There were 11 plants selected in F2-1 population whose grain weight more than 18 gr. Thus, there were only 3 plants selected in F2-2 population whose grain weight more than 10 gr.

***Keywords*— wheat, selection, plant, F2 population**

I. INTRODUCTION

Wheat is the raw material of flour that is widely used to produce products such as noodles, biscuits, bread, and pasta. Community life style changes lead to increasingly high levels of fast food consumption such as instant noodles, bread and other things and this is not just happening in urban communities but began venturing to all regions of the country. The tendency of society Indonesia consume processed product derived from wheat led to the increasing needs of wheat from year to year.

Grain production in the country is still low so that import grain can not be avoided. Subtropical native plants, grain wheat is reported by Indonesia statistics (2010) as food producing starch after rice in the last five years. Wheat varieties that have been removed including the Selayar, Gods, and Nias. Improvement of wheat varieties that have nothing to do with plant breeding program. The success of the program depends on the breeding of the genetic material is used that can be gained through exploration, mutations, hybridization, biotechnology, and the introduction. One reason for the necessity of the introduction is because wheat is not native to Indonesia so that different agroclimate conditions with areas of origin led to variations in appearance (phenotype) as a form of response or adaptation process.

Artificial hybridization is an attempt to combine superior traits into the same plant. The result is a mixture of plants homogenized F1 heterozygous. The highest genetic diversity in the nature of a crossed look on the next generation, the generation of F2. The F2 population, also with a population with a high level of segregation so lets do the selection based on certain criteria. One of the parameters that determine the genetic selection is heritabilitas.

Heritability in the broad sense is the proportion of the genetic diversity of the magnitude of quantity range of phenotypes of a certain characte. The value of heritabrility is a measure to see how big of a genetic influence in controlling fenotipenya [9]. Heritabilitas values range from 0-1 or 0-100%. [10] noted that selection on populations of bersegregasi is done through the besarn character values fenotipenya. Methods used to estimate the value of hetitabilitas depends on the population of which is owned by emulia and the goals you want to achieve. [5] confirmed that

heritability is a genetic parameters are effective in conducting an effective selection. Effective selection determines the level of success breeding activities. Heritability can be used in the determination of the method of selection. if the value is higher then the narrow meaning heritabilitas more precise using mass selection.

In addition to heritability, other genetic parameters important in determining the selection criteria is the genetic variability. Related genetic diversity variability in individuals within a population. [7] States that genetic variation also plays a role in determining the success of our breeding goals. According to [3] stated that the evaluation of genetic variation in the nature of improvements provide opportunities and got a genotype excelled. Therefore heritability and study genetic variability in populations of F2 key election conducted in a strain-strain excels.

The purpose of this research was to select some plant in each population based on yield and yield component, in order to improve these characters in the next generation of plant.

II. Materials and Methods

This research was carried out September 2012 to January 2013 in Nagari Alahan Panjang, sub-district of Lembah Gumanti, The district of Solok, West Sumatra Province.

The research used two F2 populations (F2-1 and F2-2) derived from Slovakia and Selayar as a local variety. Each population F2 was planted as many as 240 seeds in two beds and Selayar in one bed consist of 120 seeds. . Planting distance used was 25 cm x 20 cm and planted one seed in each hole.

Maintenance include fertilizing, weeding and spraying pesticides. Weeding weeds carried out every week.In addition to this given the pesticide (gramoxon, curacron, antracol) once a week. The fertilizer used is 150 kg/ha of Urea, SP36/ha 200 kg, and 100 kg KCl/ha. The fertilizer is given by making the escape about 5 cm from the line of planting and then covered with soil.

Observations was done on spike length, number of productive tillers, number of spikelet and yield. Quantitative Data are displayed in the form of averages, range of phenotypes, genetic diversity, standard deviation, heritabilitas in a broad sense, and genetic variability

III. Result and Discussion

A Planting varieties of Selayar is devoted to estimate environmental diversity that occurs on the experiment. As the varieties already released, individuals in a population of Selayar is homogeneous and has the same genetic constitution. The diversity occurring in the individual arises as a result of environmental influences. Observations on Selayar variety presented at Table 1.

Table 1 showed that there were difference variability among characters. Number of productive tiller and yield had the highest variability. Those characters had standar deviations 0-5,06. It means their character's range were not wide.

TABLE I
MEAN, VARIABILITY AND STANDAR DEVIATIONS OF SELAYAR

Character	Mean	Fenotipic variability	Standar deviation
Number of productive tiller	11,70	25,57	5,06
Spike length (cm)	9,07	0,28	0,53
Spikelet number of spike	17,90	2,54	1,60
Yield (g)	5,73	11,06	3,33

Every segregation population has a genetic characteristics diference. This affects to select indviduals on the population. Therefore, It need to know the genetic parameters of each population. Population genetic parameters F2-1 are presented in Table 2.

TABLE II
GENETIC PARAMETER OF SOME CHARACTERS IN F2-1 POPULATION

Characters	μ	σp	σe	σg	h^2	2.Stdev	Variability range
Number of productive tiller	26,61	99,79	25,57	74,22	74,38	19,98	wide
Spike length (cm)	11,39	108,13	0,28	107,85	99,75	20,80	wide
Spikelet number of spike	20,22	22,26	2,54	19,72	88,57	9,44	wide
Yield (g)	10,01	76,96	11,06	65,90	85,62	17,55	wide

All characters have a wide variability range and a high broad sense heritability (Table 2). It means, selection can be effective on this population. Thus, we hope that a mean value will be higher to the next plant generation on the selected individual. The new population was F3 population. Indvidual have ben selected presented on Table 3.

TABLE III
NUMBER SELECTED INDIVIDUAL IN F2-1 POPULATION

c	Criteria	Total
Number of productive tiller	> 35	16
Spike length (cm)	> 11	14
Spikelet number of spike	> 25	11
Yield (g)	> 18	11

Mean value of productive tiller number was 26,61. For selection, we increase criteria above their mean (35). Based on this criteria, there were 16 individual plant selected (Table 3). Spike length was also using a criteria which is above its mean. So, by this criteris, we choose 14 plants. Both spikelet number of spike and yield got 11 individual for the next planting season.

In F2-2 population, both their heritability and variability support selection for the next generation (Table 4). It means that these characters were influent by genetic variation than eviromental variation.

TABLE IV
GENETIC PARAMETER OF SOME CHARACTERS IN F2-2 POPULATION.

Characters	μ	σp	σe	σg	h^2	2.Stdev	Variability range
Number of productive tiller	26,61	99,79	25,57	74,22	74,38	19,98	Wide
Spike length (cm)	11,39	108,13	0,28	107,85	99,75	20,80	Wide
Spikelet number of spike	20,22	22,26	2,54	19,72	88,57	9,44	Wide
Yield (g)	10,01	76,96	11,06	65,90	85,62	17,55	Wide

A wide variability range made a possibility to choose some individual plant.

The number selected individual can be seen on Table 5.

TABLE V
GENETIC PARAMETER OF SOME CHARACTERS IN F2-2 POPULATION.

characters	Criteria	Total
Number of productive tiller	> 35	14
Spike length (cm)	> 11	10
Spikelet number of spike	> 20	24
Yield (g)	> 10	3

Both F2-1 dan F2-1 populations have the sama character for selection. But there were a little bit difference in criteria. Spikelet number of spike and yield criteria were different among F2 population. In F2-1, it was used spikelet number above 20 to select individual and it got 24 plants. For the yield, plants having more than 10 gr will be selected. Only 3 plants can be chose for the next plantation

IV. CONCLUSIONS

Heritability of those characters was high. There were 16 plants selected from F2-1 population and 14 plants selected from F2-2 population which have productive tillers more than 35. Hence, Spike length has a correlation with yield. Both of F2 population selected individual plants whose spike above 11 cm. Therefore, selected 14 plants in F2-1 and 10 plants in F2-2. Spikelet number of spike influence the yield so that selection based on it will be important. In F2-1 population, it was selected 11 plants having more 25 spikelet number. On the other hand, it was selected 24 plants in F2-2 population having more 20 spikelet number. The everage yield (grain weight) of these populations was different. There were 11 plants selected in F2-1 population whose grain weight more than 18 gr. Thus, there were only 3 plants selected in F2-2 population whose grain weight more than 10 gr.

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