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The Study of Sorghum (*Sorghum bicolor* L.) Performance at West Sumatera

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***Abstract*—Study on the growth and yield components of appearance some sorghum genotypes carried out beginning March 2014 until June 2014 in Limau Manih Padang. The purpose of research was to look at the differences in growth and yield components of plant sorghum genotypes in some lowland areas. A genotype test is numbered genotype in G10, G15, G33, G34, G38 and G41 originating from Balitsereal Maros is a collection of the Faculty of agriculture Unand. Methods used in this research is planted genotype sorghum in a plot undersized 1.5 x 2 m. Sample observed a carpel of a genotype is sample 5. Recording quantitative data which were made to the appearance of high-growth component of the sorghum plant, number of leaves, while the dry weights of agronomist components plant dry weight, root dry weight, panicle length, panicle and 1000 seed weight of each plant. The observations indicate that the G41 highest (337cm) and has the heaviest weighting panicle (80 g), while the G15 has dried matter weight (323g), G33 has the most lengthy panicle (28 cm) and weighs the heaviest roots (41g). Weight of 1000 seeds is the most heavily owned by sorghum with G38 numbered 47, 5 g.**

***Keywords*— Sorghum, performance, growth,.**

I. INTRODUCTION

Sorghum crop is a plant of the family graminae are physiologically classified to C4 plants. Cereal crops included sorghum (grain). Plant sorghum (Sorghum bicolor l.) is a plant that has been long known in Indonesia, especially in Java, NTB and NTT. Is a staple food for most of the local community. Compared to other crop such as rice, corn and sorghum development has not been as good as both of those commodities, this is because the area is at least still utilize plant sorghum as food ingredients. Compared to other countries the production of sorghum in Indonesia still very low, even in general sorghum not available yet in product markets. In developed countries such as the USA and Japan sorghum have been utilized as the processed products as biscuits and other food instant [4], [5].

According to the soe 2013, plant sorghum been tested cropping, as in Cibinong Lampung, Surabaya Celebes and Yogyakarta with the production 100 ton / ha / years. Sorghum crops once actually pretty satisfying, and in Indonesia including Lampung. Sorghum not only be used as food but also used as fodder and used as a source of renewable energy alternative. According to 2012 sihono (seeds) not only sorghum that can be harnessed but nira plant stalks sorghum may be squeezed for raw materials and tillable a shortage of bioetanol nor drinks [13]. Results from several agencies in Indonesia show that sorghum not only be used as food but can also be used as bioetanol material and agro-industry as raw material for pulp and paper.

Fatriasari et al (2012) reported that bagase shorgum that is a component of the pulp and paper potentially as - substitutions short fiber and has the chemical nature good as the womb high selulosa [7]. Further Supriyanto and Heri (2012) declaring that the sorghum can be used as raw materials board particles [11].

Considering its utility that is so widely known as the concept of 5F (Food, Feed, Fiber, Fuel and Fertilizers) then the economic potential for the development of sorghum is promising as processed commodities in small or large industrial scale. Some agencies have been conducting research and development of sorghum as PATIR-BATAN in collaboration with many partners both from within and outside the country. These included domestic partners is the Directorate of Cereals, seeds of Directorate, Directorate General of food crops, the Ministry of agriculture, and some of the Provincial Department of agriculture and counties. In addition, PATIR-BATAN is also collaborating with several colleges including the University of Gadjah Mada (UGM) in Yogyakarta, Bogor agricultural University (IPB), and the University of Pajajaran (UNPAD) in Bandung.

Nevertheless the development of sorghum still centered into the eastern part of the region such as in Java, which is somewhat different to the agroecology region of Sumatra, West Sumatra in particular. This is certainly going to affect the genotype-genotype sorghum developed tailored to the local area. Hence the need for characterization of crops and gathering information on the growth of plants on land-land marginal given the nearly most marginal dry lands the surly there in Sumatra is primarily ultisol. Which is about 45.794.000 ha or approximately 25% of the total land area of Indonesia. There is the widest spread in Borneo (21.938.000 ha), followed by Sumatra (9.469.000 ha), Maluku and Papua (8.859.000 ha), Sulawesi (4.303.000 ha), Java (1.172.000 ha), and Nusa Tenggara (53,000 ha). This land can be found at a variety of relief, ranging from flat to mountainous.

II. Material And Methods

The experiment was conducted in Limau Manih, Padang which is a low land area, on ultisol. The implementation of activities at the start of March to July 2014. The plant material in this research is genotype collections the University of Andalas obtained from BALITSEREAL MAROS. Genotyping is genotype numbered 10, 15, 33, 34, 38 and 41. The trial Court granted the code by adding the letter G at the beginning of the number.

Planting field done after of land management and making plot experiment size 1.5 x 3 m and granting manure by doses 20 tons / ha. Seed to be planted soaked beforehand for two hours, then planted by means drilled land deep as 2 cm at a distance cropping 70 x 15 cm, each hole cropping put 2 pieces seeds.

Aplication of fertilizer done in two stages, the first stage provided fertilizer at 1 WAP (week after planting), the 2nd phase is given at the time the plant was 4 WAP. In the first stage of fertilizer urea was given a dose (100 kg/ha), SP 36 (100kgt/ha), and KCl (100 kg/ha). On second stage urea fertilizer only was given a half dosage. Fertilizer is given with the array's system.

Maintenance plant done according to the conditions field, maintenance of weeding weed in plants was 4 and 8 WAP purpose weeding very important to keep sanitation the environmental from flies borer plants can be minimized. Observation research is done periodically on every week. The observation is made against 5 fruits of plants samples for each mapped experiment. The Parameter observed is a component growth namely height plant, number of leaves on 12 WAP (harvest), flowering, age and a component of production namely weights dry matter, weights dry panicles; weights dried root and weights of 1000 seed.

III. RESULT AND DISCUSSION

A. *Growth Component*

The observations of several characters agronomist sorghum made against such a high plant variables, number of leaves, leaf length, flowering age, made at the time the plants reach maximum vegetative growth, yield components, such as characters, while weights and lengths of heavy panicle per plant, dried matter weight, dried root weights, as well as the weight of 1000 seeds is performed after harvest, by first drying the sorghum in the oven for 3 days at a temperature of 60^{o}C. the average value of each character tested genotypes are presented in table 1 and 6

TABLE I
MEAN VALUE OF OBSERVATIONS GROWTH COMPONENTS OF PLANTS (12 WEEKS AFTER PLANTING) AND FLOWERING AGE.

Genotype Number	Plant Height (cm)	Number of Leaves (blade)	Leaf length (cm)	Flowering Age (days)
G10	273	10	88	53
G15	316	9	82	54
G33	290	9	73	55
G34	167	7	71	60
G38	169	8	84	60
G41	337	9	80	60

Measurement results of high-growth component of the plant and the number of leaves and the flowering age showed that sorghum genotypes G41 has an average height of the highest plant among other genotypes with high 5 plant 337 cm whereas genotype numbered 34 had the lowest average high of 167 cm. Height is the measurement of plant growth that are most easily observed as an indicator of the growth reflects the expansion of the volume of the plant. Based on the classification of higher plants, flowering and leaf age, Yusro (2011) categorizes sorghum into 5 groups of plant height, 5 types of sorghum based on age as well as the two groups based on the type of plant leaves, can be seen in table 2, and 3.

The number of leaves is an indicator of the ability of photosynthetic organisms to plants in the light of their captivity. Norman, 1979 in Gardner et al., 1994 stated the physical dimension and structure of canopy largerly determine the efficiency of radiation reception by a plant. On table 1 indicated that genotype G10 is the genotype with the average value of the highest number of leaves (10 blades) are meanwhile genotype G34 has the average value of the smallest amount of leaves that are 7 strands.

Age of flowering was observed at the time the plant began to enter the generative phase is marked by the appearance of the panicle flag leaves. Sorghum G10 is a fast do flowering genotypes (53 DAP), while 3 other Genotype i.e. G34, 38 and 41 has a longer flowering period i.e. 60 DAP. It shows that the time of flowering is affected by genetic conditions, as well as environmental conditions. The yield components approach is based on the empirical observation that growth during a critical window of time around anthesis is related to the number of grains per plant or per unit area [1].

TABLE II
CRITERIA HEIGHT OF SORGHUM

Criteria	Height of plant
Very Short	>100 meter
Short	100 – 150 m
Moderate	150 – 200 m
High	200 2 250 m
Very High	>250 m

TABLE III
CLASSIFICATION OF SORGUM BASED ON FLOWERING AGE

Criteria	Flowering Age (days)
Very Short plant	< 50
Short plant	51 – 60
Moderate plant	61 – 70
Long live plant	71 – 80
Very Long live plant	>80

TABLE IV
CLASSIFICATION OF SORGHUM BASED ON THE TYPE OF PLANT LEAVES

Criteria	Leaf lenght (cm)
Errect	<70
Curve	>70

TABLE V
CLASSIFICATION OF SORGUM BASED ON MORPHOLOGY DESCRIPTION

Genotype number	Plant height	Type of plant leaves	Flowering age (days)
G10	Very high	Curve	Short
G15	Very high	Curve	Short
G33	Very high	Curve	Short
G34	Moderate	Curve	Short
G38	Moderate	Curve	Short
G41	Very high	Curve	Short

B. *Yield Component*

The production component of the observations in the form of dried material weights showed that sorghum genotypes G15 has the heaviest weighting (323g), while the lowest was genotype G38. Weight of dry matter is a very important variable for a presumes the ability of plants produce dry matter during his life and reflects the result of the photosynthesis of plants. The weight of dry material consists of the dry weight of leaves and stems of organ. according to Gahoonia and Nielsen (1996) a plant said to be efficient when the plant is able to show growth and form a better dried ingredients from other plants.

TABLE VI
MEAN VALUE OF COMPONENT PRODUCTION, WEIGHT OF DRY MATTER, ROOT, PANICLE AND 1000 OF SEED.

Number of Genotype	Weight dry matter (g)	Weight dry root (g)	Weight panicle (g)	Lenght of panicle (cm)	Weight of 1000 seed (g)
G10	204	35	66,67	21	28,5
G15	323	17	71,50	31	34,5
G33	140	41	77,83	28	36,5
G34	176	19	67,67	24	37
G38	147	15	69,67	23	47,5
G41	161	12	80,00	21	40

Table 6 shows that G33 has a dry weight of roots of the highest (41g) whereas the lowest was G41 (12g). The dry weights of roots shows traffic the plant in absorbing water and nutrient elements as well as a description of the plant respond to environmental conditions, especially subsurface soil. Panicles is economically plant organ describes the result from the difference between photosynthesis during respiration by the process of growth in addition, panicles of weight observation of lenght panicles show that genotype G15 having long panicles highest 33cm while the lowest is 21 cm. Whereas for weighting 1.000 highest seeds owned by genotype G38 (47,5g) and the lowest 28.5g is G10. It indicates that size seeds owned by G38 larger than G10.

IV. CONCLUSIONS

Sorghum that have been researched having the nature and of different characteristics on all the parameters observed except at the age of the flowering and type of leaves. The properties of agronomy to six of the genotype of an average of almost the same. To know more clearly, the nature of which is more affect crop production sorghum need to do research into the direction of the technique of cultivation to evaluate the outcome of agronomy.

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REFERENCES

[1] Armen R. Kemanian , Claudio O. S., David R. Huggins, Luis M. V. A simple method to estimate harvest index in grain crops. Field Crops Research 103 (2007) 208–216., www.elsevier.com/locate/fcr

[2] R Anonim. 2013. Lahan Tanaman Sorgum di Indonesia Akan Diperluas. Diakses di http://www.bumn.go.id/ptpn12/ publikasi/berita/lahan-tanaman-sorgum-di-indonesia-akan-diperluas-2/ tanggal 10 Februruari 2014.

[3] Brenda L. Gambín and Lucas BorrásA. Adding genotypic differences in reproductive partitioning and grain set efficiency for estimating sorghum grain number. www.publish.csiro.au/journals/cp. Journal compilation _ CSIRO 2013

[4] Batan. 2012. Pemuliaan Tanaman Sorgum Di Patir – Batan http://www.batan.go.id /patir/_berita/pert/sorgum/sorgum.html. akses 12 Oktober 2012.

[5] Dirjen Tanaman Pangan. 2012. Budidaya Tanaman Sorgum. http://www. deptan.go.id. Akses : 12 Oktober 2012.

[6] Dirjen Tanaman Pangan. Kemitraan Usaha dalam Pengembangan Pangan. 2012. Alternatif. Leaflet.

[7] Fatriasari, Widya., Supriyanto, dan Iswanto, Apri Heri. 2012. Pemanfaatan Sorghum sebagai bahan pulp dan kertas. Makalah Workshop on The Current Status an Challenges in Sorghum Development in Indonesia. Bogor 25-26 Sepetember 2012. SEAMEO BIOTROP. Bogor.

[8] Gahoonia TS, Nielson NL. 1996. Variation and acqusition of soil phosporus among wheat and barley genotypes. Plant and soil 178:223-230

[9] Prasetyo, B.H. dan Suriadikarta D.A. 2006. Karakteristik, potensi, dan teknologi Pengelolaan tanah ultisol untuk Pengembangan pertanian lahan Kering di indonesia. Jurnal Litbang Pertanian, 25(2) : (39-47).

[10] Setiawan,A., Chozin, M. dan Hasanudin. 2007. Pertumbuhan dan hasil tanaman sorgum pada jenis dan dosis pupuk kandang yang berbeda. Abstrak. Undergraduated thesis, Fakultas pertanian unib.

[11] Supriyanto, dan Iswanto, Apri Heri. 2012. Peman.faatan Limbah batang sorghum sebagai bahan baku papan partikel. Makalah Workshop on The Curren Status an Challenges in Sorghum Development in Indonesia. Bogor 25-26 September 2012. SEAMEO BIOTROP. Bogor.
[12] Supriyanto. 2012. Pengembangan Sorgum untuk Menunjang Kebutuhan Pangan, Pakan, Energi dan Industri. Leafleat. SEAMEO BIOTROP.
[13] Sihono. 2012. Penampilan Sifat Agronomi Galur Mutan Sorgum (Sorghum bicolor L. Moench) di Kabupaten Bogor. Jurnal Ilmiah Aplikasi Isotop dan Radiasi. Vol. 5 No. 1. Badan Tenaga Nuklir Nasional, BATAN.
[14] Wahida, Sennang, N.R., Hemusye, H.L. aplikasi pupuk kandang ayam pada tiga varietas sorgum (sorghum bicolor l. Moench) pasca.unhas.ac.id/jurnal/files/d2d881d09802af860dd274c7b731740d.pdf.