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Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 148 Evaluation of Morphological Characteristics and Production of Upland Rice Against Drought Stress 1Laila Nazirah, 2Edison Purba, 2Chairani Hanum, 2Abdul Rauf 1 Doctorate Student at Agricultural Science Faculty of Agriculture University of Sumatera Utara 2Lecturer at Faculty of Agriculture University of Sumatera Utara *Coorresponding Author: laila_nazirah@yahoo.co.id Abstract This study aims to determine the efficiency of water use between genotype and identify morphological characters of upland rice varieties tolerant to drought stress. The experiment was conducted in a plastic house in North Aceh, from January 2015 to May 2015.

The study design was Split-Plot with three replications, by using two treatment factors, namely first factor is drought stress (C) consisting of 4 levels capacity airy namely: C1: 20%, C2: 40%, C3: 60% and C4: 80%. The second factor is the 10 varieties of upland rice varieties consists of 3 groups (the result of screening with PEG 6000), namely (tolerant varieties group) which consists of Ciapus, Inpago 4, Inpago 8.

(Moderate varieties group) consisting of Inpago 5, Situ Bangendit, Inpago7, Towuti, and (susceptible varieties group) which consists of Inpari 6 JATE, Inpari 33 and Sintanur. Results of the study varied response of upland rice varieties in the group receiving the response of drought stress on the plant height, days to flowering, number of panicles and grain weight. Stress group 20% (C1) all varieties decreased plant height, number of panicles and grain weight as well as speed up flowering dates.

Tolerant varieties are capable of producing that Inpago 4 and followed by Inpago 8. Groups of 40% field capacity (C2) tolerant varieties that adapt well to all the parameters are Inpago four varieties while the varieties best for moderate growth in the number of panicles and grain weight are mostly found in 60% of field capacity (C3) and the highest grain weight found in varieties Inpago 5.

80% field capacity (C4) group susceptible varieties are best found in Sintanur varieties. Keywords: Upland rice, varieties, water stress Introduction Drought can be fatal and affect the stability of the results (Babu et al, 1996), especially if the varieties grown in the old and less resistant to drought stress (Hasmosoewignjo, 1962).

Drought is also the most important limiting factor for the sustainability of the production of rice plants. This is a problem that is faced by all countries in the world producer of rice (Passioura, 2007). Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 149 Indonesia is also facing climate change due to global warming are unavoidable and will have broad impact on many aspects of life, including the agricultural sector.

Climate changes impact on the increase in the frequency and intensity of extreme weather events, changes in rainfall patterns as well as the air temperature increases and rising sea levels. Changes in rainfall patterns and rising temperatures lead to decreased agricultural production, flooding and drought caused crop acreage increasing experiencing puso (Sumaini et al, 2011).

Upland rice varieties is a source of genetic material that can be used to study varieties that have characters that can be used to study the varieties that have characters that play a role in tolerance to drought stress. This study aims to determine the efficiency of water use between genotype and identify morphological characters of upland rice varieties tolerant to drought stress.

Materials and Methods The experiment was conducted in a plastic house in North Aceh, from January 2015 to May 2015. The study design was Split-plot with three replications, with two treatment factors, namely First factor is drought stress (C) consisting of 4 level of field capacity, namely: C1: 20%, C2: 40%, C3: 60% and the C4: 80%.

The second factor is the 10 varieties of upland rice varieties consists of 3 groups (the result of screening with PEG 6000), namely tolerant varieties group consists of Ciapus, Inpago 4, Inpago 8. Moderate varieties group consisting of Inpago 5, Situ Bangendit, Inpago7, Towuti, and susceptible varieties group which consists of Inpari 6 Jete, Inpari 33 and Sintanur.

Further observation data were anaziesncn'stipRant (D at tlev of tes0:0 Results and Discussion Plant Height The result of the three groups of varieties tolerant varieties of moderate and susceptible varieties showed plant height lowest in the treatment field capacity of 20% (C1) compared with treatment field capacity of 40% (C2), 60% (C3) and 80% (C4) in (Fig. 1).) is seen a decline in plant height due to the inhibition of cell elongation and cell division.

Very noticeable decrease in plant height can be overseen at sensitive group which is Sintanur varieties (Table 2). The plant height difference caused by the difference in the amount of water received every day at the same growth stage. In the field capacity of 20% (C1) with the provision of the amount of water 300 ml situation is not in accordance with the water needs of crops of upland rice, at field capacity of 40% (C2) by providing the amount of water 600 ml per day of two groups of varieties tolerant and moderate adapted to the circumstances The environment thus revealing good growth but not for susceptible groups varieties are the best at field capacity of 80% (C4) with 1200 ml of water per day.

Water demand increase since the planting upland rice and the largest at the flowering stage (Israelsen and Hansen, 1962; Oldeman and Free, 1982). The rate in line with the needs of plant transpiration rate (Tomar and O'Toole in Oldeman and Free, 1982). Rice plant transpiration increases ranging from early growth and achieve 3-4 mm day -1 at the maximum rate of growth in the number of tillers.

Kumar et al (2009) reported that in severe drought conditions in the decrease in plant height tolerant strains of 6-12 cm while the strains are sensitive about Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 150 16-27 cm. The results showed a decrease in plant height at Sintanur varieties (susceptible) reached 32.62 cm due to drought stress.

In addition, the influence of Variability in terms of growth and results in the show by 10 varieties were tested for each of upland rice varieties has its own adaptability to the conditions of the biophysical environment and is also influenced by genetic factors which are factors that exist in these plants. Differences in the genetic makeup are one of the factors causing the appearance of plant diversity in this case the high crops.

In line with Mildaerizanti, (2008) that differences in plant height is determined by genetic factors. Gosh and Kashyap (2013) also found plant growth, besides influenced by genetic factors, are also influenced by environmental conditions to grow crops. Nyakpa et al (1988) also argues each variety has a different response to different environmental conditions. Figure 1.

Effect of High 10 Varieties of Upland Rice Plants Due to Drought Stress. Table 2. Average Relative Decline of Plants High 0 20 40 60 80 100 120 140 160 Tinggi Tanaman (cm) Varietas C1 20% C2 40% Varietas C1 (20%) Relative Decline (%) C2 (40%) Relative Decline (%) C3 (60%) Relative Decline (%) Ciapus (Toleran) 101.26 - 3.36 110.11 - 12.39 114.11 - 16.47 Inpago 4 (Toleran) 119.87 - 9.68 134.39 - 22.97 127.73 - 16.86 Inpago 8 (Toleran) 104.11 6.77 122.11 - 9.35 118.62 - 6.23 Inpago 5 (Moderat) 89.84 29.06 132.47 - 4.59 131.18 - 3.57 Situbangendit (Moderat) 98.09 6.14 104.59 - 0.08 103.51 0.95 Inpago 7 (Moderat) 98.08 4.59 106.89 - 3.97 105.39 - 2.52 Towuti (Moderat) 95.74 13.78 111.14 - 0.09 113.62 - 2.33 Inpari 6 Jete (Peka) 88.19 25.44 91 23.07 117.96 0.28 Inpari 33 (Peka) 86.1 31.46 86.79 30.91 123.37 1.80 Sintanur (Peka) 77.25 32.62 85.51 25.42 109.99 4.07 Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 151 Flowering Age and Number of Panicles Analysis of variance flowering dates indicate that tolerant varieties group of upland rice (Ciapus, Inpago 4 and Inpago 8) and the moderate varieties group (Inpago 5, situbangendit, Inpago 7 and Towuti) adapted well to the age of flowering timely in the treatment field capacity of 40% (C2) with the amount of water every day for 600 ml but susceptible varieties group (Inpari 6 jete, Inpari 33, and Sintanur) right days to flowering was at 60% field capacity (C3) with 900 ml of water per day.

Based on the description of the susceptible varieties group have good adaptability in rain-fed field and classified into paddy rice meanwhile field capacity of 20% (C1) shows the flowering dates was faster for all groups of varieties. Flowering age was also very concerned with the efficiency of water utilization. Nguyen et al, (1997) suggests a tolerance mechanisms in plants in response to drought stress include the plant's ability to keep growing in conditions of water shortage is to reduce the size of leaves and shortening the growing cycle.

For a number of panicles at 20% field capacity (C1) gives the number of panicles at least compared to other water treatment provision, the amount of the highest panicle tolerant group contained in the water supply of 40% (C2). For moderate and sensitive group, number of panicles most found in the water supply of 60% (C3), presumably due to inhibition of the development of pollen which is caused by lack of water and varieties are grown under conditions of drought stress will shorten the phase of filling grains and decrease the number of panicle or productive tillers.

Acceleration of flowering also has implications for the number of panicle and crop production (Table 3) in the treatment of 20% field capacity (C1) causes almost all varieties decreased number of panicles and grain production except in the tolerant varieties group (Inpago 4), (Inpago 8). Moderate varieties group (situbangendit) and (Towuti) this indicates that some of these varieties could potentially tolerant to drought stress as compared to other varieties. Highest number of panicles for a group of varieties are tolerant to the treatment of 40% field capacity (C2) contained in (Inpago 4).

Saragih (2010) Stating that the varieties Inpago 4 very adaptive to the environment is not good as water shortages cultivation time will not disrupt the formation and growth of rice. As for moderate and sensitive groups varieties of the highest number of panicle found on 60% field capacity (C3) which Towuti varieties and varieties Sintanur.

This is influenced by plant genetic factors which is able to adapt in a good growing environment so as to produce plenty number of panicles. Decreased number of panicles formed and high sterility. (Pirdashti et al, 2004). Liu et al (2006) reported that water stress can derail pollinated pollen for up to 67 percent of the total grains per panicle.

The average age of flowering and number of panicles due to drought stress treatment and varieties are presented in Table 3 and Figure 2 shows the difference in the number of panicles due to drought stress treatment against upland rice varieties Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 152 Table 3.

Average Age of Flowering and Total Panicles at 10 Upland Rice Varieties due to Drought Stress Drought Stress Varietas C1 (20%) C2 (40%) C3 (60%) C4 (80%) Ciapus (Toleran) 56.6± 0.o 86 57 82 00 f 75 00 j 59.5 0.n 88 00 c 82 00 f 85 00 55 12o 75 00 j 72 00 k 77 00 i 71 0. 88 00 c 87 00 88 00 c 72.3± 1.jk 89 00 c 95 00 92 00 74.6± 0.ij 81 00 f 78 00 85 00 61 0. 73 00 77.6 89 00 c 43.6± 0.q 71.3 0.0 75 00 j 77 00 49.6± 0.p 67 00 88 00 c 68 00 44.3± 0.q

62 00 63 00 67 00 Angkadi utuf yaid berda ata barkujMRT a 0. Figure 2. Effect of number of panicles 10 Varieties of Upland Rice Plants Due to Drought Stress Grain weights per Clumps Analysis of variance of grain weight at 20% of water supply (C1) showed the lowest grain production for all groups of varieties. It is a result of decreasing the number of panicles which implicate to grain production.

For tolerant and moderate groups was largely obtained at 40% of water provision (C2), while for the sensitive groups, the highest production was obtained sensitive at 80% of water provision (C4). 0 2 4 6 8 10 12 14 16 Jumlah malai Varietas C1 20% C2 40% C3 60% C4 80% Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 153

Analysis of variance of grain weight in 20% of water provision of field capacity (C1) showed the lowest grain production for all groups of varieties, or do not even produce, except in the tolerant varieties group (Inpago 4), (Inpago 8).

Moderate varieties group (situbangendit) and (Towuti) indicate that some of these varieties could potentially be tolerant to drought stress as compared to other varieties. Varieties Inpago 4, and Inpago 8 is a new upland rice varieties belonging to care group with early maturity and has a high yield potential (BPTP, 2011). In addition, the environment is a major contributing factor to the ability of a variety to improve its productivity.

Likewise with the moderate group, most of the 4 varieties adapted really well to the environment grew with 40% field capacity (C2). This also indicates that the water needs for future growth and crop production according to the needs. For field crops during growth on a full canopy, the required amount of water is about 125 mm per month and the crop water requirement and maximum evapotranspiration (ETM) and the magnitude of the multiplication of potential evapotranspiration with a crop coefficient (Oldeman et al., 1979).

For susceptible varieties group, highest results were obtained in the treatment field capacity of 80% (C4). This was because the type of varieties was tend to paddy rice then with water provision every day as much as 1200 ml of an actual condition for the environment to grow such varieties (Inpari 6 jete , Inpari 33 and Sintanur).

Mean weight of dry grain per clump due to drought stress treatment and varieties are presented in Fig 3. Figure 3. Effect of production of dry grain per clump 10 Varieties of Upland Rice Plants Due to Drought Stress. Conclusion Diverse group response of upland rice varieties in drought stress response received on the plant height, days to flowering, number of panicles and grain weight. Stress group 20% (C1) all varieties decreased plant height, number of panicles and grain weight as well as speed up flowering dates.

Tolerant varieties are capable of producing that Inpago 4 and followed by Inpago 8. Groups of 40% field capacity (C2) tolerant varieties that adapt well to all the parameters are Inpago four varieties while the varieties best for moderate growth in the number of panicles and grain weight are mostly found in 60% of field capacity 0 5 10 15 20 25 30 35 berat Gabah/rumpun (g) Varietas C1 20% C2 40% C3 60% C4 80% Proceedings of The 1th Almuslim International Conference on Science, Technology and Society (AICSTS) 2015 November 7-8, 2015, Bireuen, Indonesia 154 (C3) and the highest grain weight found in varieties Inpago 5. 80% field capacity (C4) group susceptible varieties are best found in Sintanur varieties.

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