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Root Performance of Drought Tolerant Rice Evaluated Using Rootbox Under Submerge and Drought Condition Ahmad Junaedi¹, Iskandar Lubis¹, Muhamad Achmad Chozin¹, Maisura Ali², Jun-Ichi Sakagami³, Hiroshi Ehara⁴ 1 Bogor Agricultural University, 2Malikussaleh University, 3 Kagoshima University, 4 Mie University Introduction Developing tolerant rice against drought condition and rice genotypes that have high water use efficiency may keep important rule to sustain rice production under water scarcity issue caused by global warming phenomena.

Previously, the agronomical responses toward drought and water consumption of some rice varieties have been evaluated under vinyl house. As response to drought stress evaluated using drought tolerant index by yield, Jatiluhur, Ciherang and Way Apo Buru showed relatively tolerant, Silugonggo and IPB 3S showed moderately tolerant, whereas IR-64, Menthik Wangi and Rokan showed relatively sensitive.

Water consumption of the same varieties were evaluated with transplanted rice seedling in container box (67-47-37 cm length-width-depth containing 83 kg of air dried soil). Water consumption among rice varieties showed vary in range of 15.93 l plant⁻¹ for IR-64 to 24.13 l plant⁻¹ for Jatiluhur (equal with 3,186 to 4,826 m³ ha⁻¹). Jatiluhur showed the most efficient use of water (0.99 g l⁻¹) whereas IR-64 and Way Apo Buru showed less efficient one (0.46 g l⁻¹ and 0.41 g l⁻¹, respectively).

The objective of **this research was** to investigate root performance under submerge and drought condition using the same rice varieties in the previously studied. We hypothesized that drought **tolerant rice varieties** might have different root performance than that of susceptible one; as well as for rice showed different water used efficiency. Materials and Methods **This research was** performed under vinyl house at Field

Experimental Farm of Bogor Agricultural University, Dramaga, Bogor.

Rice varieties consisted of IR-64, Ciherang, IPB 3S, Menthik Wangi, and Rokan hybrid (lowland type), Way Apo Buru (amphibian type), Jatiluhur, and Silugonggo (upland type). Rootboxes were made from wood and glasses as shown in Fig.1. Room space of soil media in side boxes was 30-5-40 cm of length-width- depth. Root boxes were placed inside plastic container box (Fig.2), filled with soil media and watered till submerged, then incubated for one week.

Rice seedlings were transplanted at 12 days old, one plant per rootbox, and grown till 7 weeks after transplanting (WAT). Treatment consisted of submerge during rice growing (SM), and watered was stopped at 3 WAT for simulated drought condition (DC). In 7 WAT, rootboxes were moved out from the container and observed for root dispersion and biomass.

Root dispersion was observed by separated in depth (vertically) by A, B, C, D layer with depth (cm) of 0-10, 10-20, 20-30, and 30-40, respectively; and horizontally by "1" and "2" with distance (cm) 0-5 and 5-15 from center or rice hill. Fig. 1. Rootbox preparation Fig. 2. Watering and rice growing Results and Discussions Figure 3 showed root dispersion in each varieties. Fig. 3.

Root performance of Jatiluhur, Ciherang, IPB 3S, and Way Apo Buru Varieties Note: S for Submerge, and D for Drought treatment The results showed that drought stress inhibits root development either vertically or horizontally at 0-10 cm, 10-20 cm, 20-30 cm and 30-40 cm depth. These indicated by decreased of total root weight, root depth achievement, and root thickness.

The least decrease due to drought stress on total root weight showed by Jatiluhur and IPB 3S varieties (12.41%, 36.41% respectively). The highest increasing in root depth showed by Way Apo Buru (46.05 cm) followed by IPB 3S (37.05 cm) varieties. Drought condition mostly implied to higher shoot to root ratio.

Drought tolerant index was positively correlated with total root dry weight and relative leaf water content, and negatively correlated with the shoot to root ratio. Total root dry weight, leaf relative water content, root depth, root thickness and the low density of stomata during drought stress can be used as selection criteria for drought tolerant varieties.

Jatiluhur Ciherang IPB 3S Way Apo Buru

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