

Resistance Test and Physiological Response of Several Mycorrhizal inoculated Soybean Varieties Against Drought

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ABSTRACT

Selection of soybeans that are resistant to rainfed dry land is important to increase soybean production on very large marginal lands in Gunung Kidul area. This study aims to select and obtain an overview of the resistance of several soybean cultivars that are quite productive on dry land or relatively tolerant cultivars on rainfed land. Optimization of marginal land is done by adding manure and mycorrhizal inoculation.

Tests for resistance to dry stress of several soybean varieties were carried out experimentally, using the germination bioassay method and/or germination vigor tests in vitro and ex vitro. Conditions of osmotic stress or potential stress of water in the in vitro culture medium were simulated using various concentrations of PEG-6000. PEG resistance test in vitro was given at a concentration range of 0; 2.5; 5.0 and 7.5% PEG in ½ MS basic medium. Ex vitro germination and vigor tests were carried out in petri dishes with variations of PEG 0; 5; 10; 15; and 20%). Soybean resistance to drought was also tested by testing its growth and productivity on rain-fed soil added with manure and ash in a ratio of 2:2:1. Variations in drought levels are conditioned by variations in the frequency of watering (1x/day; 1x/2hr; 1x/4 hr). Mycorrhiza inoculant treatment was given in two levels, namely with (M1) and without mycorrhizal inoculation (M0). Drought resistance test of 5 soybean cultivars viewed from physiological parameters including plant height, number of leaves, number of branches, number of inflorescences and pod production as well as chlorophyll and proline content. Quantitative data were analyzed using descriptive statistics and/or inferential statistics using factorial analysis of variance to see whether there was an interaction effect between mycorrhizal factors and watering frequency on the tested soybean cultivars, followed by testing the effects of main factors and/or simple effects, as needed.

From the ex vitro germination and vigor tests of sprouts on variations in PEG concentrations, it was found that up to a dose of 20%, PEG did not suppress germination, but instead suppressed radicle and hypocotyl growth of sprouts. The same fact was confirmed from the in vitro test results, but with a sharper level of inhibitory effect than the ex vitro test results. From the growth and productivity tests it was found that there was no significant interaction effect of the three factors (M-F-cultivars), but only between the factors of watering frequency and cultivar type, especially on the number of leaves, number of branches, number of inflorescences and number of pods produced. Another fact was found that the chlorophyll a content was affected by the interaction of the frequency of watering factors (drought level) and cultivar type, but had no significant effect on the chlorophyll b content. Another interesting fact is that the production of proline in soybeans is not affected by the interactions between the three factors, but only by the cultivar type.

Kata Kunci: Soybean variety, Mycorrhiza, drought stress, physiological responses