INTISARI

Cekaman kekeringan merupakan salah satu faktor abiotik terpenting yang membatasi pertumbuhan dan hasil tanaman kedelai. Tanaman yang tahan kering pada umumnya mempunyai sistem perakaran yang luas dan atau dalam. Inokulasi mikoriza dapat meningkatkan luas perakaran dan mempengaruhi sifat fisiologis tanaman. Penelitian tentang hubungan sifat perakaran, sifat fisiologis dan tanggapan terhadap mikoriza pada kultivar kedelai dengan tingkat ketahanan terhadap cekaman kekeringan dilakukan pada Juli 2012 sampai Oktober 2013. Tujuan dari penelitian ini adalah untuk mempelajari tanggapan kultivar kedelai terhadap cekaman kekeringan; tanggapan kultivar kedelai terhadap inokulasi mikoriza; sifat perakaran, sifat fisiologis dan tingkat ketahanan terhadap cekaman kekeringan kultivar kedelai yang tanggap dan tidak tanggap inokulasi mikoriza; peranan mikoriza terhadap perubahan sifat perakaran, sifat fisiologis dan tingkat ketahanan kekeringan. Delapan belas kultivar kedelai di seleksi untuk mendapatkan empat kultivar dengan hasil tinggi yang tahan dan tidak tahan terhadap cekaman kekeringan serta tanggap dan tidak tanggap terhadap inokulasi mikoriza. Pengamatan dilakukan terhadap sifat perakaran, sifat fisiologis dan pertumbuhan dan hasil.

Hasil penelitian menunjukkan bahwa kultivar kedelai yang tahan kering (Kaba) mempunyai sudut akar dan dimensi fraktal yang lebih besar dibandingkan yang tidak tahan kering (Sibayak). Secara umum cekaman kekeringan menurunkan sistem perakaran (luas permukaan akar dan panjang akar), sifat fisiologis tanaman (luas daun, klorofil a, kelembapan nisbi sel, konsentrasi CO_2 sel dan laju fotosintesis) serta pertumbuhan tanaman tetapi meningkatkan suhu daun. Kadar prolin, laju fotosintesis dan laju asimilasi bersih lebih tinggi pada kultivar yang tahan kering (Kaba dan Malabar) dibandingkan yang tidak tahan kering (Anjasmoro dan Sibayak). Pertumbuhan tanaman (bobot kering akar, bobot kering tajuk dan total bobot kering tanaman) secara nyata menurun ketika terjadi cekaman kekeringan meskipun tidak terdapat perbedaan pertumbuhan antara kultivar Kaba, Malabar, Anjasmoro dan Sibayak.

Inokulasi mikoriza menyebabkan dimensi fraktal kultivar kedelai yang tahan kering (Kaba dan Malabar) dan tidak tahan kering (Anjasmoro dan Sibayak) menjadi tidak berbeda. Cekaman kekeringan tidak menurunkan sistem perakaran (panjang akar) dan sifat fisiologis (kelembapan nisbi sel, kadar CO_2 sel, kadar klorofil a, kadar klorofil b, laju fotosintesis) serta tidak meningkatkan suhu daun ketika diinokulasi mikoriza. Inokulasi mikoriza pada kultivar yang tidak tahan kering tetapi tanggap inokulasi (Anjasmoro) meningkatkan kadar prolin, laju fotosintesis dan laju asimilasi bersih. Inokulasi mikoriza menyebabkan bobot kering tajuk dan bobot kering total tanaman kultivar kedelai yang tanggap inokulasi mikoriza (Kaba dan Anjasmoro) lebih tinggi dibandingkan dengan kultivar yang tidak tanggap inokulasi mikoriza (Malabar dan Sibayak), meskipun tidak terdapat perbedaan hasil antara kultivar yang tanggap dan tidak tanggap terhadap inokulasi mikoriza. Inokulasi mikoriza meningkatkan ketahanan terhadap cekaman kekeringan melalui peningkatan sebaran perakaran dan proses fisiologis.

Kata kunci : sifat perakaran, sifat fisiologis, tanggapan mikoriza, ketahanan kekeringan kultivar kedelai

Abstract

Drought stress is considered to be one of the most important abiotic factors limiting plant growth and yield of soybean. The drought tolerant plants generally have extensive root systems and or deep root systems. Mychorrizal inoculation can increase root surface area and affecst physiological of plant. Research on the relationship of the root characteristic, the physiological and the response of soybean cultivars to mychorrizal with level of drought tolerance was conducted from July 2012 to October 2013. The objective of the research were to investigate the resistance of soybean cultivars to drought stress; the response of soybean cultivars to mycorrhizal inoculation; the root characteristics, physiological and level of drought tolerance in soybean cultivars were responsive and unresponsive to mycorrhizal inoculation and the role of mychorrizal on alteration of the root characteristics, physiological and level of drought tolerance. The selection of 18 soybean cultivars was done to get the four cultivars which high yield, tolerant and non-tolerant to drought, as well as responsive and unresponsive to mycorrhizal inoculation. Observations include the root characteristics, the physiological, growth and yield.

The results of the research showed that drought tolerance cultivars (Kaba) had larger the angle of root and the fractal dimension value than those of cultivars which susceptible to drought. Drought stress decreased root systems (root surface area and root lenght), physiological (leaf area, chlorophyll a, relative humidity of cell, CO_2 concentration of cell and photosynthetic rate) and growth but increased temperature of leaf. The prolin content, rate of photosynthesis and net assimilation rate of the drought tolerance cultivars (Kaba and Malabar) were higher those of susceptible to drought (Anjasmoro and Sibayak). The growth of plant (dry weight of root, dry weight of shoot and total dry weight of plant) significantly decreased under drought stress but there were not different between Kaba, Malabar, Anjasmoro and Sibayak cultivars.

Mychorrizal inoculation caused fractal dimension value of drought tolerance cultivars (Kaba and Malabar) did not differ with susceptible to drought (Anjasmoro and Sibayak). With mychorrizal inoculation, drought stress did not cause any decrease in root systems (root lenght), physiological (chlorophyll a, chlorophyll b, relative humidity of cell, CO_2 concentration of cell, photosynthetic rate) and did not increase in the temperature of leaf. Mychorrizal inoculation on cultivar which susceptible to drought and responsive to mychorrizal inoculation (Anjasmoro) increased prolin content, rate of photosynthetic and net assimilation rate. Mychorrizal inoculation caused the dry weight of shoot and total dry weight of plant in cultivars which responsive to mychorrizal inoculation (Kaba and Anjasmoro) higher than those of unresponsive to mychorrizal inoculation (Malabar and Sibayak), although the yield were not different between cultivars. Mychorrizal inoculation increased resistance to drought stress by improvement of root distribution and physiological process.

Keywords: root characteristics, physiological, response to mychorrizal, resistance to drought stress, soybean, cultivar