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Response of Physiological Growth Indices and Bulb Dry Yield of Onion (*Allium cepa* L.) Genotypes to Priming and Seed Size

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Introduction

Priming is one of the most common methods of improving seed quality, which significantly affects their storability. Seed priming is a seed treatment that allows imbibition and activation of the initial metabolic events associated with seed germination, but prevents radicle emergence and growth. In other words, phase one and two of seed water imbibition curve are passed, but seeds do not enter the third phase of water uptake. Then seeds are dried back to their original water content. Seed priming is a pre-sowing strategy for influencing seed germination and seedling development by modulating pre-germination metabolic activity prior to emergence of the radicle and generally enhances germination rate and plant performance. Naturally, when speed and percentage emergence of germinating seeds are being high, growing sources like light, water and nutrient will be more used. Another factor that can affect the seed germination and seedling establishment is the seed size. As generally known, among producing factors, seed as the first consumer store, plays an important role in the transfer of genetic characters and improvement of qualitative and quantitative traits of production. One of the most important factors in maximizing crop yield is planting high quality seed. Seed size is an important physical indicator of seed quality that affects vegetative growth and is frequently related to yield, market grade factors and harvest efficiency. In the present paper, effects of different pre-sowing treatments and seed size on physiological growth indices and bulb dry yield of onion cultivars were investigated.

Materials and Methods

In order to determine the response of physiological growth indices and bulb dry yield of onion to priming and seed size, a field experiment was conducted in 2012-2013 cropping season at Agriculture and Natural Resources Research Center of East, Azarbayjan, Iran. This experiment was a factorial experiment based on a randomized complete block design with three replications. Experiment treatments included priminig at four levels: hydropriming, osmopriming (in %2KNO_3), priminig with falomin amino acid (in 2%) and control (without priming). Seed samples of the two cultivars were sieved by slotted screens and placed into three groups of seed diameter size: small, medium and large and cultivars at two levels: Red Azarshahr and Zarghun. The physiological growth indices such as total dry matter, leaf area index, crop growth rate, net assimilation rate, bulb growth rate and bulb fresh and dry yield were studied.

Results and Discussion

Results of field experiment showed that seed priming improved growth indices such as dry matter accumulation (DMA), crop growth rate (CGR), net assimilation rate (NAR), relative growth rate (RGR), bulb growth rate (BGR) and leaf aria index (LAI) in both cultivars. The highest bulb fresh, dry yield and dry matter percentage (54400, 6800 kg/ha and11/80 %) belonged to priminig with folammine amino acid, respectively. The results of growth analysis indicated that the maximum and minimum growth indices values were obtained from large and small seeds, respectively. Mean comparison showed that the highest bulb fresh yield (53.26 ton/ha), bulb dry yield (9.95 ton/ha) and bulb dry matter (11.47 %) were achieved from large seeds. Mean comparison indicated that the highest bulb fresh yield (43.40 ton/ha), bulb dry yield (5.43 ton/ha) and bulb dry matter (11.47 %) were observed in Red Azarshahr.

Conclusions

Seed priming treatments improved bulb fresh and dry yield, total dry matter, leaf area index, crop growth rate, bulb growth rate, relative growth rate and net assimilation rate as compared to the unprimed. Among the

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treatments, seed priming with Falomin Amino Acid 2% was more effective than the potassium nitrite 2% and hydropriming. Large seed size significantly increased the bulb fresh and dry yield and physiological growth indices. The highest bulb fresh and dry yield, total dry matter, leaf area index, crop growth rate, bulb growth rate, relative growth rate and net assimilation rate were achieved in larger seeds compared to other sizes. Accordingly, the importance of seed priming and grading seeds were obvious in this study, so seed priming with Falomin Amino Acid 2% and large seed size should be used for onion planting in order to insure high bulb fresh and dry yield and physiological growth indices of onion. Nevertheless, seed priming and seed size improved bulb fresh, and dry yield and physiological growth indices of onion cultivars were attributed to rapid seedling emergence and establishment, and consequently the optimum use of light, soil moisture and nutrients by the plants developed from the primed seeds and seed size. Therefore priming with falomin Amino Acid 2% and large seeds are recommended in onion planting for the places with the same environmental conditions of this experiment.

Keywords: Bulb growth rate, Dry matter accumulation, Net assimilation rate

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