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Effects of Growth Regulators and Explants on Callus Induction and Organogenesis in *Hypericum perforatum* L.

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Keywords: callus induction, growth regulators, *Hypericum perforatum* L., organogenesis

Abstract

Hypericum perforatum is an important medicinal plant that its essence such as hypericine and hyperforin has properties such as anti-depressant, antiviral and antibacterial. In this research the effect of different levels of growth regulators (IAA and BAP) and explants type (root, shoot, leaf) on callus induction and organogenesis of *Hypericum perforatum* were studied through factorial experiment with completely randomized design with five replications and five samples per experimental unit. Explants such as roots, stems and leaves from sterilized seedlings were cultured on MS medium containing different concentrations of IAA (0.0, 0.5, 1.2 mg/l) and BAP (0.0, 0.4, 0.8 mg/l). We incubated the samples in the dark at 23°C for 28 days. After this period, traits including callus weight, number of roots and number of shoots were measured. Highly significant differences were observed for all the measured traits. For the root explants, the highest number of shoots, callus weight and number of roots were observed with 1.0 mg/l IAA, 1.0 mg/l IAA and also with 0.8 mg/l BAP, and 2.0 mg/l IAA, respectively. For stem explants, the highest number of shoots, callus weight and number of roots were induced with 0.8 mg/l BAP, 2.0 mg/l IAA and also 0.4 mg/l BAP, and 0.4 mg/l BAP, respectively. Whereas, for leaf explants, the highest number of shoots, callus weight and number of roots were observed in the treatments with 0.5 mg/l IAA and also 0.8 mg/l BAP, 2.0 mg/l IAA and also 0.4 mg/l BAP, and 2.0 mg/l IAA, respectively.

Study of the Critical Period of Weed Control in Thyme (*Thymus vulgaris* L.)

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Keywords: *Thymus vulgaris*, logistic and Weibull model, weed critical period, yield

Abstract

The critical period for weed control (CPWC) is a key component of an integrated weed management (IWM) program. During this period of crop growth, weeds must be controlled to prevent yield losses. Therefore, to determine the critical period of weed control in Thyme, an experiment was carried out in a randomized complete block design with 18 treatments and three replications in 2008-2009 at the experimental field of Shahed University Research Institute. Two series of the treatments including weed-free and weed-infested fields were applied in the regular intervals of 15, 30, 45, 60, 75, 90, 105 and 120 days right after the beginning of thyme growth at spring. Two check treatments including full and no control of weed during the whole season were also included. The logistic and Weibull models were applied to determine the critical period of weed control. The results showed that periods of weed-free and weed-infested significantly affected the dry weight and number of weeds in all treatments ($p \leq 0.01$). Considering 5% and 10% of the expectable yield loss in the models, critical periods of weed control were between 41-90 days and 54-76 days for fresh weight, 12-94 days and 29-78 days for dry weights, and 20-105 days and 30-86 days for essence yield after the beginning of growth at spring.

The Effect of Altitude on *Thyme* Pharmaceutical Plant Species Yield, Grown Wild and Cultivated

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Keywords: altitude, *Thyme*, pharmaceutical plant, *Kotschyamus bois*, thymol, carvacrol

Abstract

Determining the effect of altitude on plant yield is very important. Therefore, the impact of altitude (1600, 2200, and 2800 m above sea level) on two *Thyme* species (*Kotschyamus bois* and *K. vulgaris*, wild and cultivated, respectively), with randomized complete block design in three replications was conducted. Growth indicators such as plant canopy diameter, height, annual growth, fresh and dry weight, percent secondary metabolites and essential oil yield were measured. Effect of altitude on *vulgaris* was significant at 1% level. *Thymus vulgaris* species in some traits have measured more than 2 times the growth performance comparing with wild species. The percent secondary metabolites were significant between the two species. Out of 30 chemical components identified, 12 component of *vulgaris* species were significant at 1% level and thymol with 55%, alpha Terpinen with 13%, gamma Terpinen with 9% and carvacrol with 5.5% were the highest percentage of active material produced in *vulgaris*. On the other hand, 7 active drug substances were significant at 1% and 5% level on wild *Kotschyamus bois* species comparing to cultivated ones. In this study, the dominant active drug substance for *vulgaris* and *Kotschyamus bois* were thymol and carvacrol, respectively.

The Effect of Drought Stress and Biologic Fertilizers on Fenugreek

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Keywords: drought stress, biologic fertilizers, irrigation, nitroxin, biosulphur

Abstract

One of the important medicinal plants in Iran is Fenugreek (*Trigonella foenum – graecum*). In order to evaluate the effect of different irrigation levels on fenugreek growth, a field experiment was carried out in split plot design based on randomized complete block with 3 replications in 2010 at Kerman – Iran. Treatments consisted of 3 irrigation levels (7 days, 10 das and 14 days) as the main factor and 4 fertilizer levels (Nitroxin (1 kg /ha), Biosulphur (5 kg /ha), Nitroxin+ Biosulphur (as mentioned), and Control treatment) as the sub factor. Traits such as plant height, number of branches, number of capsules per plant, number of seeds per capsule, capsule's length, and width of capsules, fresh weight and dry weight, weight of 1000 seeds, Economical and biological biomass , yield and harvest index were measured. Harvest index was calculated accordingly. Irrigation had significant effect on all of the studied traits except on capsule width and the number of stems per plant. Plants under the shortest irrigation period had the best performance. For the weight of 1000 – seeds there was not a significant different which it means the best of trait amounts were obtained with jointed application of Nitroxin and Biosulphur and all of the biological levels had a significant different than the control treatment. The interaction between irrigation stress and biologic fertilizer was not significant. It indicates that using biologic fertilizers under stress conditions was leaded to yield increase. It can be said in regular irrigation plant doesn't face with stress; also jointed application of biologic fertilizer can lead to highest production.

Evaluation of Drought Tolerance Induction by Biologic Fertilizer in Funegreek

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Keywords: drought tolerance, biologic fertilizers, irrigation, nitroxin, biosulphur

Abstract

In order to evaluate drought tolerance induction by biologic fertilizer in Funegreek, a field experiment was carried out in split plot design based on randomized complete block with 3 replications in 2010 at Kerman-Iran. Treatments consisted of 3 irrigation levels (7 days, 10 days, 14 days) as the main factor and 4 fertilizer levels a (Nitroxin – Biosulphur – Nitroxin + Biosulphur – Control treatment) as the sub factor. Throughout the variance analysis it became obvious that the effect stress and biologic fertilizers in fenugreek is significant. The best performance was obtained through the regular and prevalent irrigation treatment joint with nitroxin and biosulfur application. Seven drought tolerance indices including stress susceptibility index, stress tolerance index, tolerance, yield index, yield stability index, mean productivity and geometric mean productivity were used. The indices were adjusted based on grain yield under drought and normal conditions. In order to investigate the effect of biologic fertilizers in inducing drought tolerance this evaluation was conducted using the tolerance indices. Due to TOL and SSI Joint application treatment of biologic fertilizers lead to the better tolerance in Fenugreek. Control and nitroxin treatment showed the lowest tolerance induction. Due to GMP and HM indices joint with application of nitroxin and biosulfur fertilizers lead to the most tolerant level.

Evaluation of Cumin (*Cuminum Cyminum L.*) Landraces under Drought Stress Based on Some Agronomic Traits

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Keywords: cumin, drought stress, grain yield

Abstract

Environmental stress, especially drought stress, can play an important role in the reduction of plant performance in arid and semi arid regions in Iran. In order to study the effects of drought stress on agronomic traits in Iranian cumin population, an experiment was conducted based on lattice with two replications at horticultural research Institute at Shahid Bahonar University of Kerman-Iran in 2009. Nine populations (consisted of 49 sub populations) were studied in drought stress and normal conditions. The characteristics such as number of umbels per plant, number of seeds per umbel, number of seeds per plant, dry matter weight, 1000 seeds weight and grain yield were recorded. The results showed that drought stress had only significant effects on number of seeds per plant and grain yield ($p < 0.05$). Yazd population (1.15 g) followed by Khorasan-Jonoobi (1.05 g) and Pars (1.02 g) had the highest grain yield. It seems that in drought stress condition, the number of seed per plant was the most affecting factor on grain yield.

The Effect of Drought Stress and Priming of Salicylic Acid and Manganese Sulphate on Fenugreek

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Keywords: Drought, stress, salicylic acid, manganese sulphate

Abstract

Drought is one of the most important limiting factors all over the world and also is the most prevalent environment stress, which limits production in almost 25% of the lands of the world. Fenugreek is one of the important medicinal plants, which cannot tolerate limited water condition. In order to evaluate the effect of irrigation interval on yield performance of fenugreek, a field experiment was carried out in split plot design based on randomized complete block with 3 replications in 2010 at Kerman. Treatments consisted of three irrigation intervals including (7 days, 10 days and 14 days) as the main factor and different salicylic acid treatment consisted of seed soaks, foliar spray and had soaking foliar application of manganese sulphate as well as control as the sub factor. Traits such as plant height, the number of stems per plant, the number of capsules per plant, the number of seeds per capsule, capsule length, fresh weight, dry weight, weight of 1000-seeds, the width and length of capsule sheath, biological and grain yield and harvest index were measured. Based on the result, stress caused a significant decrease for all traits. Highest grain yield belonged to 7 days irrigation. Different levels of priming treatment had significant effect for all the traits. In all the traits, joint application of seed soaking and foliar spray of salicylic acid showed the best performance while control and manganese sulphate showed the lowest amount of traits. Interaction effect of stress by treatment was non significant for all the different traits. It means the applied treatment had the same trends for all stress condition. It can be concluded, stress can reduce the economic production of fenugreek, and the best yield was produced at normal irrigation and also priming can increase the yield and make the plant more tolerant.