

## MOISTURE-DEPENDENT PHYSICAL PROPERTIES OF SEEDLESS AND SEEDED RAISIN (*VITIS VINIFERA* L.) VARIETIES

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**ABSTRACT.** Some physical properties of seedless and seeded raisin berries varieties were evaluated as a function of moisture content, varying from 16.12% to 35.63% (d.b.) for seedless berries and from 17.33 to 34.41% (d.b.) for seeded raisin berries. The average dimensions, shape, and mass of the both raisin berries increased as moisture content increased. The mass of 1000 berries increased linearly. Besides, in seedless berries, the bulk density increased, the true density and porosity decreased, while in seeded berries the bulk and true density decreased, but porosity increased. The Weibull distribution model statistically characterized raisins on the basis of berries dimensions for classifying and separating targets. The results indicate that classifying raisin berries by means of bivariate Weibull distribution in terms of the length and width is useful in describing the process under study and designing or calibrating the hole sizes of classifiers machinery.

**Key words:** Physical properties; Moisture content; Raisin berries; Weibull distribution; Classification; Dried fruits; South Azerbaijan.

## DEVELOPMENT OF AN EXTERIOR-MOUNT REAL TIME SUGAR BEET YIELD MONITORING SYSTEM FOR A SUGAR BEET HARVESTER

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**ABSTRACT.** The main priorities in crop production are increasing the yield and decreasing the cost of production. Precision farming is the best practice to approach these goals. For real time measurement of sugar beet yield, a yield monitor was developed, and installed on the exterior side of the harvester's chassis. The advantage of this arrangement over similar systems is the location of the load cell and system's frame which prevents blockage by trash, mud or plant roots. For measurement of weight, one load cell on each side of the harvester chassis was used. Conveyor and ground speeds were measured using two proximity sensors. Because vibrations of the harvester can affect the output signals, it is necessary to find the main bandwidth associated with the weights moving on the conveyor. For this purpose, three different masses were placed on the moving conveyor and this bandwidth was determined using signal processing. Then, a suitable filter was designed and undesirable frequencies acting as noise were attenuated. After calibrating all the sensors, final evaluation of the system was performed in the field and the mean and standard deviation of error were 6.48% and 1.52, respectively. Although the error may seem to be somewhat high but the low of standard deviation indicates that there is a similar error in all tests. These negative errors indicate that the weight is systematically overestimated by the monitor. Thus, the error can be reduced by minor changes in conveyor shape or modified by software means. By software modification, the systematic error was alleviated. The median sugar beet yield was thus obtained to be 42.7 t/ha. Comparing this with the actual mean yield of 41.8 t/ha, it differs by only about 2%.

**Key words:** Sugar beet; Precision farming; Yield monitor; Yield map.

## **WATER USE EFFICIENCY AND RAIN WATER PRODUCTIVITY OF WHEAT UNDER VARIOUS TILLAGE-GLYPHOSATE INTERACTIVE SYSTEMS**

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**ABSTRACT.** Rainfed wheat is generally grown in rotation with summer fallow in medium to high rainfall zone of Pothwar plateau of Pakistan. The present study was, therefore, conducted to investigate the impact of shallow and deep tillage practices, with and without herbicide (glyphosate) application, on moisture conservation and subsequent wheat yields. The study also aimed to examine the feasibility of substituting intensive shallow tillage with single application of glyphosate. The experiment was laid out in randomized complete block design with three replicates and net plot size of 14 m x 10 m, during 2007 and 2008 at two locations i.e high and medium rainfall. Wheat cultivar “GA-2002” was planted as a test crop. The data showed the superiority of conservation tillage in terms of conservation of moisture and increasing grain yields. Results also elaborated that tillage cannot be completely eliminated for profitable fallow management. However, deep ploughing with moldboard followed by single application of glyphosate proved potential option for substituting shallow tillage carried out during summer (kharif). The additional benefits under this tillage system included saving in fuel, labour and lower depreciation and maintenance costs for tillage machinery in addition to unquantifiable environmental benefits.

**Key words:** Wheat; Water use efficiency; Tillage; Glyphosate; Wheat yield.

## **POTASSIUM FERTILIZATION INFLUENCES GROWTH, PHYSIOLOGY AND NUTRIENTS UPTAKE OF MAIZE (*ZEA MAYS* L.)**

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**ABSTRACT.** A pot experiment in wire house was conducted to investigate the effect of potassium fertilization on physiology, growth and nutrient uptake of maize. Surface soil samples were collected and analyzed for soil physico-chemical properties and NPK contents. Pots were saturated with water and filled with soil (5 kg soil/pot). Potassium fertilizer was applied in five different treatments as T1, T2, T3, T4 and T5 with 0, 70, 100, 130, and 160 kg ha<sup>-1</sup>, respectively. Nitrogen and phosphorus were applied @ 250 and 100 kg ha<sup>-1</sup> (recommended), respectively, in all the pots, including control. Experiment was planned in completely randomized design (CRD), with three repeats. Plant growth, nutrient uptake and concentration in roots and shoots, net photosynthesis, rate of transpiration, stomatal conductance and substomatal CO<sub>2</sub> concentration were significantly improved with increasing K application rate. It also increased water use efficiency (WUE) and decreased root: shoot dry weight ratio of maize. Treatment T3 resulted in maximum growth, physiological characteristics and nutrient uptake. It was concluded that K fertilization improves physiological characteristics resulting in enhanced WUE and nutrient uptake eventually producing more yield. It is recommended to apply K fertilization in drought stress conditions.

**Key words:** Nutrient uptake; Photosynthesis; Root: shoot ratio; Stomatal conductance; Water use efficiency.

## **ECONOMIC YIELD, FIBER TRAIT AND SUCKING INSECT PEST INCIDENCE ON ADVANCED GENOTYPES OF COTTON IN PAKISTAN**

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**ABSTRACT.** To evaluate resistance against sucking insect pest of cotton 16 cultivars were used along with their economic yield and fiber traits. Population of jassid, whitefly and thrips was recorded by using leaf turn method, yield of seed cotton was determined by hand harvesting method, while qualitative fiber properties were measured through high volume instrumentation (HVI) method. Best yield performance and staple length was of FH-158 (4000 kg/ha) (28.1 mm), respectively. Cotton cultivar FH-172 showed resistance toward jassid and thrips but FH-158 showed resistance against jassid. Thus these resistance cultivars along with other cultivars possessing resistance against insect pest should be explored. Additional research should identify the part of one pest species on the yield and fiber quality of cotton by managing other pest species to define better management strategies.

**Key words:** Productivity; Whitefly; Jassid; Thrips; HVI; Seed cotton; Textile industry.

## **EFFECT OF WATER DEFICIT STRESS AND FOLIAR APPLICATION OF SALICYLIC ACID ON ANTIOXIDANTS ENZYMES ACTIVITY IN LEAVES OF *THYMUS DAENENSIS* SUBSP. *LANCIFOLIUS***

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**ABSTRACT.** In order to study the effects of water deficit stress and foliar application of salicylic acid (SA) on the activity of five antioxidant enzymes (catalase - CAT; EC 1.11.1.6, ascorbate peroxidase - APX; EC 1.11.1.11, glutathione reductase - GR; EC 1.6.4.2, peroxidase - POD; EC 1.11.1.7 and polyphenol oxidase - PPO; 1.14.18.1) of *Thymus daenensis* (subsp. *lancifolius*), an experiment was conducted in factorial based on completely randomized design with three replicates, during 2013. Drought treated seedlings showed elevated levels of reactive oxygen species (ROSs), with a concomitant increase in the activities of the enzymes CAT, APX, GR, POD and PPO, compared to controls. Under medium water deficit, APX and PPO activities significantly increased by higher SA concentration (2 mM), but under control and severe water deficit conditions, there was no significant difference between 1 mM and 2 mM concentrations regarding APX and PPO activity. Under all levels of available water, increase in SA concentration from 0.1 mM to 1 mM induced significant increase in GR activity. The maximum amount of GR (under medium water deficit condition) achieved from 1mM of SA. While the maximum amounts of APX, PPO (under medium water deficit condition), CAT and POD (under severe water deficit condition) achieved from 2 mM of SA. In total, our results suggest that application of SA (as a trigger of signal cascade) could be advantageous against water deficit stress, and could protect thyme plants in mentioned conditions.

**Key words:** Antioxidant enzymes; Thyme; Reactive oxygen species; Water deficit stress.

## **PUTRESCINE IMPROVE LOW TEMPERATURE TOLERANCE OF FENNEL (*FOENICULUM VULGARE* MILL.) SEEDS**

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**ABSTRACT.** The effects of polyamine priming on the germination behaviour of fennel at low temperatures were investigated. For preparing the putrescine pretreatments, seeds were divided into four parts. Two samples primed into putrescine (10 or 20 ppm) for 24 h, other samples were as controls. In order to eliminate the effect of water from test results, seeds were soaked in water only. After the priming, seeds were dried and used for germination test at 10 and 20 °C. Except for seedling dry weight, all of the priming treatments improved germination performance and seedling growth of fennel seeds. Maximum germination percentage was achieved by 10 ppm Put application and lower value was observed in control seeds. About the energy of germination and mean germination time, polyamine treatments had better effect than hydropriming, but similar results was observed from seeds treated by 10 ppm Put and hydroprime on root and shoot length. Results showed that adequate presence of Put in the priming media had better than priming with water only. However, high concentrations of Put had not significant effect as well as 10 ppm Put. These results indicated that 10 ppm Put priming could be as an effective method to improve low temperature tolerance of fennel seeds.

**Key words:** Fennel; Germination performance; Low temperature; Putrescine; Seedling growth.

## **RESPONSE OF BERSEEM CLOVER (*TRIFOLIUM ALEXANDRINUM* L.) TO CHEMICAL, BIOLOGICAL AND INTEGRATED USE OF FERTILIZERS**

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**ABSTRACT.** To evaluate the effect of different fertilizer types on the vegetative growth characteristics, yield and forage quality of berseem clover (*Trifolium alexandrinum*), the present experiment was conducted in Mahidasht Agriculture and Natural Resources Research Station (Kermanshah, Iran), during 2011 and 2012 growing seasons. The experimental treatments consisted of control (no fertilizer), chemical fertilizer, biological fertilizer and different combinations of chemical and biological fertilizing systems. A complete randomized block design with three replicates was employed for analysis of the data for each year. A combined analysis of variance was conducted to compare the data from the two years of the experiment. The results showed that the highest forage yield (172.1 g/m<sup>2</sup>) was produced in integrated fertilizer application (urea chemical fertilizer + mycorrhiza treatment). The highest crude protein content of 25% was obtained from integrated biological fertilizer treatment (nitrogen-fixing bacteria + phosphorus-solubilizing bacteria treatment). The superiority of integrated fertilizer application for higher forage production and biological fertilizer application for higher forage quality in berseem clover could be recommended by the results of this experiment. Application of integrated fertilizing treatments not only optimized the chemical fertilizer application (consequently reducing the environmental pollutions), but it also enhanced forage quality in terms of higher macro a micronutrients concentrations. According to the results of this study it could be concluded that integrated fertilizing treatments may be accounted more efficient in dry farming than in irrigated agroecosystems.

**Key words:** Berseem clover; Fertilizer types; Forage yield; Forage quality.

## NITROGEN DEFICIENCY STRESS INDICES OF SEED YIELD IN RAPESEED (*BRASSICA NAPUS* L.) GENOTYPES

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**ABSTRACT.** Most of investigations showed that nitrogen fertilizers gave substantial rapeseed yield increases even in diverse and contradicting conditions but in a few studies were focused on nitrogen deficiency stress effects. Some of important seed yield stress indices based on application and non application of nitrogen (N+ and N0) was studied using six spring rapeseed varieties and their 15 F<sub>2</sub> progenies. Significant mean squares of genotypes effects were observed for potential yield (Y<sub>p</sub>), stress yield (Y<sub>s</sub>), mean productivity (MP), geometric mean productivity (GMP), tolerance index (TOL), stress tolerance index (STI) and stress susceptibility index (SSI), indicating significant genetic differences of the genotypes for the stress indices. The genotypes including PF7045/91 and RGS003 had the high mean values of MP and GMP and STI, therefore considered as high potential parents in both nitrogen application conditions. On the basis of low mean value of TOL and SSI indices, PF7045/91 and 19H were considered as tolerant to nitrogen deficiency stress. Most of the crosses with high mean values of MP, GMP and STI had at least one parent with high mean values of these stress indices. Significant positive correlation of Y<sub>p</sub> and Y<sub>s</sub> with MP, GMP and STI, indicating selection based on these stress indices will increase the Y<sub>p</sub> and Y<sub>s</sub> of the genotypes. Heterozygosity had important role for stability of traits in different conditions, therefore in compare to parents their F<sub>2</sub> progenies had low mean values of SSI and TOL indices.

**Key words:** Diallel; Genetic parameters; Heterosis; Narrow-sense heritability; Rapeseed.

## COMPARATIVE STUDY REGARDING *IN VITRO* INFECTIONS WITH *ERWINIA AMYLOVORA* AND *PSEUDOMONAS SYRINGAE* PV. *SYRINGAE* ON *POMACEAE* SPECIES

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**ABSTRACT.** The knowledge about pome fruit trees bacterioses and their evolution in orchards is a major objective for plant protection. *Erwinia amylovora* and *Pseudomonas syringae* pv. *syringae* cause on attacked organs of *Pomaceae* species similar dieback symptoms in vegetative and flowering shoots of quince, pear and apple in spring. Both bacteria can produce disastrous diseases in orchards and are therefore of great economic importance. Biological materials represented by vegetative shoots, leaves and fruits of *Pyrus* spp., *Malus* spp., *Cydonia* spp. were used after isolation of different *E. amylovora* and *Ps. syringae* pv. *syringae* strains for *in vitro* infections. Results presented in this study established that for *in vitro* inoculation of *Pomaceae* species similar symptoms in case of leaves and, respectively different symptoms for vegetative shoots and fruits occurred. The occurrence time was the only difference, because *Ps. syringae* pv. *syringae* spread faster than *E. amylovora*. The vegetative shoots inoculated with *E. amylovora*, in comparison to *Ps. syringae* pv. *syringae*, were more damaged and for both bacteria the highest values for attack degree were recorded in case of pear species, followed by quince and apples, respectively.

**Key words:** Fire blight; Bacterial blossom blight; Inoculation; Pathogenicity test.

**REZUMAT.** Studiu comparativ privind infecția *in vitro* cu *Erwinia amylovora* și *Pseudomonas syringae* pv. *syringae* la unele specii din familia *Pomaceae*. Acumularea cunoștințelor despre bacteriozele pomilor semănători și evoluția lor în livezi reprezintă un obiectiv major pentru protecția plantelor. *Erwinia amylovora* și *Pseudomonas syringae* pv. *syringae* produc, pe părțile aeriene ale speciilor din familia *Pomaceae*, simptome caracteristice, care se observă primăvara, în special la nivelul lăstarilor vegetativi și al mugurilor floriferi. Lăstari vegetativi, frunze și fructe de *Pyrus* spp., *Malus* spp. și *Cydonia* spp. au fost utilizate pentru infecții *in vitro* cu tulpini de *Erwinia amylovora* și *Pseudomonas syringae* pv. *syringae*. Rezultatele prezentate în acest studiu au stabilit că, pentru inocularea *in vitro* a speciilor de *Pomaceae* cu tulpinile bacteriene, simptomatologia a fost similară în cazul frunzelor și diferită în cazul lăstarilor vegetativi și al fructelor. Timpul scurs până la manifestarea bolii reprezintă o primă diferență între cele două specii bacteriene, în sensul că bacteria *Ps. syringae* pv. *syringae* produce simptome mai repede decât bacteria *E. amylovora*. Lăstarii vegetativi, infectați cu *E. amylovora*, au fost mai afectați, comparativ cu cei infectați cu *Ps. syringae* pv. *syringae* și în cazul ambelor specii bacteriene, cele mai mari valori pentru gradul de atac înregistrându-se la păr, urmat de gutui și măr.

**Cuvinte cheie:** focul bacterian al rozaceelor; arsura bacteriană comună; inoculare; test de patogenitate.

## **PROLINE, PROTEIN, RWC AND MSI CONTENTS AFFECTED BY PACLOBUTRAZOL AND WATER DEFICIT TREATMENTS IN STRAWBERRY CV. PAROS**

**S. PARVIN, T. JAVADI, N. GHADERI**

**ABSTRACT.** Drought is one of the critical environmental stresses that affect growth and development of plants. Plants are damaged directly and indirectly under drought stress. Increasing water stress tolerance in plants is crucial. The aim of this study was to investigate the effects of different water stress levels (-1, -5, and -10 bars) and paclobutrazol application (0 and 50 mg<sup>-1</sup>) on strawberry cv. Paros. According to analyses of variance there were significant effects of drought stress and paclobutrazol application on leaf area, leaf dry weight, leaf relative water content (RWC), cell membrane stability index (MSI), proline and protein content of leaves. Leaf area, leaf dry weight, leaf relative water content and cell membrane stability index decreased in drought stress, especially at -10 bars. Proline and protein contents were enhanced by increasing water stress levels. Paclobutrazol application increased leaf relative water content and cell membrane stability index, proline and protein contents of leaves. Leaf relative water content was 68.77% in -10 bars drought stress that increased to 79% in paclobutrazol treatment. Also, cell membrane stability index was 69.65% in severe drought stress and reached to 77% in paclobutrazol treatment. According to the results paclobutrazol is a benefit substance to ameliorate drought stress effects in strawberry cv. Paros.

**Key words:** Strawberry (*Fragaria xananassa*); Drought stress; Morphological traits; Biochemical characteristics; Physiological traits; Abiotic stress.