

BREAKAGE SUSCEPTIBILITY OF WHEAT AND TRITICALE SEEDS RELATED TO MOISTURE CONTENT AND IMPACT ENERGY

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ABSTRACT. Mechanical damage of seeds due to harvest, handling and other process is an important factor that affects the quality and quantity of seeds. Seed damage result in lower grain value, storability problem, and reduced seed germination and seedling vigor and subsequent yield of crops. The objective of this research was to determine the effects of moisture content and impact energy on the breakage susceptibility of wheat and triticale seeds. The experiments were conducted at five moisture contents of 7.5, 12, 17, 22 and 27% w.b. and at the impact energies of 0.05 and 0.1 J. The percentage of breakage of both wheat and triticale seeds increased as impact energy increased. The analysis of variance showed that there was a significant difference between breakage susceptibility of wheat and triticale seeds at the 1% probability level. Triticale seeds had more breakage than wheat seeds. For both wheat and triticale seeds as the moisture content of the seeds increased, the amount of the percentage breakage of seeds decreased as a polynomial. The average values of percentage breakage of wheat seeds decreased from 43.81 to 19.88% as the moisture content increased from 7.5 to 27%. Over this same moisture content range the percentage breakage of triticale seeds varied from 81.34 to 37.77%. Below the moisture contents of 17% for the wheat and 22% for the triticale the percentage breakage of seeds increased dramatically.

Key words: Wheat, triticale, mechanical damage, harvesting, handling, processing, moisture content, impact energy.

EFFECT OF ZINC SULFATE ON QUANTITATIVE AND QUALITATIVE CHARACTERISTICS OF CORN (*ZEA MAYS*) IN DROUGHT STRESS

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ABSTRACT. In hot and arid regions, drought stress is considered as one of the main reasons for yield reduction. To study the effect of drought stress and zinc spray on the yield and yield components of corn, an experiment was carried out during the crop seasons of 2010 and 2011 on Research Farm, Islamic Azad University of Gonabad as a split factorial within randomized complete block design with three replications. The main plots with irrigation factor and four levels were considered: A) full irrigation, B) stopping irrigation at pollination step, and C) stopping irrigation at the seed filling and four levels of zinc sulfate including 0 and 0.5%, 1% and 1.5% spraying (tassel initiation and grain filling) were as the subplots. The drought stress reduced the thousand kernels weight (TKW) in seed filling stage and the number of seeds per ear in tasseling stage about 11% and 27% less than the one of control treatment, respectively. Zinc increased the thousand kernels weight from 27.3 to 31.3 grams and induced an increase in the number of seeds per ear from 710 to 770. The results obtained within the present research showed that zinc spray has fairly improved the effects caused by drought stress.

Key words: Drought stress; Zinc; Spray; Corn.

ASSESSMENT OF DROUGHT TOLERANCE INDICES IN BREAD WHEAT GENOTYPES UNDER DIFFERENT SOWING DATES

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ABSTRACT. The capability of a genotype to achieve acceptable yield over a broad range of sub-optimum and suitable conditions is extremely imperative. Late planting and end-season drought stress are two main factors limiting wheat yield in northwest of Iran. In a 2-year field experiment at Miandoab, Iran, the ability of several selection indices to identify drought resistant genotypes under different sowing dates and moisture conditions were evaluated. Six genotypes of differing response to water scarcity were planted at 20-d intervals on three dates from 11 October to 20 November. Drought resistance indices were utilized on the basis of grain yield under end-season drought (Y_s) and normal (Y_N) conditions. Evaluation of MP, HARM, GM, STI, TOL, SSI, RDI, YSI and Y_r indicated that late sowing (20 Nov) significantly decreased drought tolerance in all investigated genotypes. However, yield comparisons under normal and terminal drought stress conditions revealed that promising lines (C-81-4, C-81-10, C-81-14 and C-82-12) had better performance than local checks (Zarrin and Alvand). Furthermore under both moisture conditions C-81-10 genotype had the greatest grain yield. Based on drought indices like as MP, GMP, STI and HARM C-81-10 genotype introduced as the most tolerant genotype to end-season drought stress. Grain yield showed a positive and significant correlation with HARM, GMP, MP, STI and YI indices were more efficient for recognizing high performance genotypes under different sowing dates and diverse moisture stress.

Key words: Genotypic variation; Grain yield; Moisture stress; Sowing time; *Triticum aestivum*.

THE EVOLUTION OF SOIL FERTILITY UNDER LONG-TERM EXPERIMENTS IN THE MOLDAVIAN PLATEAU

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ABSTRACT. The paper presented the results of investigations concerning the influence of long-term fertilization (43 years) on some chemical characteristics of soil from the Moldavian Plateau, of wheat-maize rotation. The studies were performed on a typical cambic chernozem soil, prevailing in the Moldavian Plateau, and followed the dosing of fertilizers which ensures an efficient production increases and determines maintain or increase soil organic carbon content. Soil that has been placed experiences-clay loam, neutral to slightly acid reaction and a medium nutrient supply. On lands from the Moldavian Plateau, maintaining a good supply in mobile phosphorus for field crops (37-72 mg/kg) was done in case of the annual application of a rate of $N_{100}P_{100}$, and a very good supply in mobile phosphorus (69-78) and mobile potassium (over 200 mg/kg) was found at a rate of $N_{100}P_{100}+60$ t/ha manure. In wheat-maize rotation, applying a rate of $N_{100}P_{100}$, for 43 years, has determined the pH decrease until the limit of moderately acid interval (5.1-5.8) and was maintained within the weakly acid interval (5.9-6.8) in case of the annual application of a rate of $N_{50}P_{50} + 60$ t/ha manure. Soil organic carbon content, in wheat - maize rotation, decreased after 43 years of experiences from 19.8 to 16.3 g/kg in unfertilized variant and until 18.1 g/kg in case of the annual application of a rate of $N_{100}P_{100}$. In wheat - maize rotation, the significant increase in organic carbon content from soil has been registered at higher than $N_{50}P_{50} + 40$ t/ha manure and at $N_{100}P_{100} + 60$ t/ha manure.

The determinations of mean annual amounts of nitrogen exported from soil by wheat (grains + straw) have shown that in wheat crop, its values varied according to fertilizers system, between 71.5 and 128.4 kg/ha. In maize crop, of the mean annual amounts of nitrogen exported from soil varied according to applied fertilizers, between 64.6 and 178.9 kg/ha.

Key words: Fertilization; Manure; Nitrogen; Phosphorus; Organic carbon; Wheat; Maize.

REZUMAT. Evoluția fertilității solului în experiențele de lungă durată din Podișul Moldovei. Lucrarea prezintă rezultatele cercetărilor privind influența fertilizării de lungă durată (43 ani) asupra unor însușiri chimice ale cernoziomului cambic din Podișul Moldovei, în rotația grâu-porumb. Studiile au fost efectuate pe un sol cernoziom cambic tipic, care predomină în Podișul Moldovei, și au urmărit stabilirea dozelor de îngrășăminte care asigură obținerea unor sporuri eficiente de producție și care determină menținerea sau creșterea conținutului de carbon organic din sol. Solul pe care au fost amplasate experiențele are o textură luto-argiloasă, o reacție neutră spre slab acidă și o aprovizionare mijlocie în elemente nutritive. Pe terenurile în pantă din Câmpia Moldovei, menținerea unei aprovizionari bune cu fosfor mobil pentru culturile de câmp (37-72 mg/kg) s-a realizat în cazul aplicării anuale a dozei de $N_{100}P_{100}$, iar realizarea unei asigurări foarte bune cu fosfor mobil (69-78 mg/kg) și potasiu mobil (peste 200 mg/kg) la doza de $N_{100}P_{100}+60$ t/ha gunoi. În rotația grâu-porumb, aplicarea unei doze de $N_{100}P_{100}$, timp de 43 de ani, a determinat scăderea pH-ului până la limita intervalului acid moderat (5.1-5.8) și s-a menținut în intervalul slab acid (5.9-6.8), în cazul aplicării anuale a dozei $N_{50}P_{50} + 60$ t / ha gunoi de grajd. Conținutul de carbon organic din sol, în rotația grâu - porumb, a scăzut, după 43 de ani de experiență, de la 19.8 la 16.3 g / kg la varianta nefertilizată și până la 18.1 g / kg în cazul aplicării dozei de $N_{100}P_{100}$. În rotația grâu - porumb, creșterea semnificativă a conținutului de carbon organic din sol a fost înregistrată la doze mai mari decât $N_{50}P_{50} + 40$ t / ha gunoi de grajd și la $N_{100}P_{100} + 60$ t / ha gunoi de grajd. Determinările privind cantitățile medii anuale de azot exportate din sol la grâu (boabe + paie) arată că valorile au variat, în funcție de sistemul de îngrășăminte, între 71.5 și 128.4 kg / ha. La cultura de porumb, cantitățile medii anuale de azot exportate din sol au variat, în funcție de îngrășămintele aplicate, între 64.6 și 178.9 kg / ha.

Cuvinte cheie: fertilizare; gunoi de grajd; azot; fosfor; carbon organic; grâu; porumb.

OSMO AND HYDRO PRIMING MEDIATED GERMINATION IMPROVEMENT UNDER COLD STRESS CONDITIONS IN MOUNTAIN RYE (*SECALE MONTANUM*)

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ABSTRACT. Seed priming techniques have been used to increase germination, improve germination uniformity and seedling establishment under stressed conditions. Seed priming was used in rye mountain (*Secale montanum*) to increase seed germination and tolerance on stress exposure (Cold stress). Rye seeds were treated with water (Hydro priming) and polyetelyn glycol 6000 (Osmo priming). The effect of priming was assessed on germination characteristics under cold stress (at 3°C) for 7 days. Analyze of variance for hydro priming showed that temperature × time of priming interaction was significantly ($P < 0.01$) for all traits under cold stress and for osmo priming showed that Concentration of PEG × Temperature × Time of priming interaction was significantly ($P < 0.01$) for all traits under cold stress except seedling dry weight (SDW). For hydro priming the highest germination percentage (GP) was attained from hydro priming at 15±1°C for 16 h (70%), whereas the highest normal seedling

percentage (NSP) (22.5%), germination index (GI) (8.57), seedling vigor index (SVI) (38.9) and seedling length (SL) (1.7 cm) were in the hydro priming at $10\pm 1^\circ\text{C}$ for 16 h. For osmo priming the highest germination percentage (GP) (80 and 80.5%), normal seedling percentage (NSP) (48 and 45%), seedling vigor index (SVI) (101.26 and 85.25) and seedling length (SL) (2.11 and 1.89 cm) observed in the osmo priming with concentrations of -9 and -15 bar PEG at $15\pm 1^\circ\text{C}$ for 24 h.

Key words: Priming treatments; *Secale montanum*; Germination; Seedling growth; Cold stress.

AGRO-ECONOMIC EVALUATION OF VARIOUS MAIZE HYBRIDS UNDER DIFFERENT PLANTING PATTERNS

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out at the Agronomic Research Area, University of Agriculture, Faisalabad to assess the agro-economic performance of two maize hybrids (SIPRA-4444 and TS-13) under five different sowing patterns viz. ridge sowing 60 cm apart rows, bed sowing 60 cm apart rows, 60 cm apart single row strips, 90 cm apart double row strips and 120 cm apart triple row strips. The results indicated that the hybrids and the sowing patterns had a significant influence on the grain yield of maize. SIPRA-4444 produced maximum grain yield (6.02 t ha^{-1}) as compared to TS-13 (5.80 t ha^{-1}). Among the planting methods, ridge sowing produced highest grain yield (7.13 t ha^{-1}). The interactive effect of hybrids and sowing methods showed that the hybrid SIPRA - 4444 produced maximum yield when it was sown on 60 cm apart ridges. From economic point of view, maximum net income of Rs. 114172 and benefit to cost ratio of (2.37) was obtained when the hybrid SIPRA-4444 was sown on 60 cm spaced ridges.

Key words: Maize; Hybrids; Sowing patterns; Grain yield.

THE DYNAMICS OF CELL DIVISION IN SOME LOCAL POTATO VARIETIES CULTIVATED *IN VITRO* ON MICROPROPAGATION MEDIUM

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reveal the changes in cell division, as a result of the prolonged period of subculture on micropropagation medium, of five local varieties of *Solanum tuberosum* L. maintained on *in vitro* collection at Suceava Genebank, Romania. For this purpose it was used the Murashige-Skoog medium (MS-1962) with addition of 40 g/l sucrose, and 6 mg/l daminozide. The effect of prolonged period of subculture up to two and 12 months was expressed as mitotic index and frequency of cells with abnormal division. Mitotic index ranged from 20.1 to 22.1% after 12 days, between 15.5 - 17.7% after two months and between 17.7 - 19.2% after 12 months of subculture. The results obtained showed that the frequency of aberrant cells increased with the preservation time on the *in vitro* cultures and their accumulation rate depended on the genotype. Were identified interphases with micronuclei, metaphases with retarded chromosomes, ana-telophases with chromosomal bridges, retarded chromosomes and chromosomal fragments, but their percentage was low in all the genotypes.

Key words: *Solanum tuberosum* L.; Local varieties; Mitotic index; *in vitro*.

REZUMAT. Dinamica diviziunii celulare la unele varietăți de cartof, cultivate *in vitro* pr mediul de propagare. Acest studiu a fost efectuat pentru a evidenția modificările din diviziunea celulară, rezultate ca urmare a prelungirii perioadei de subcultură pe un mediu de micropropagare, la cinci varietăți locale de *Solanum tuberosum* L., menținute în colecția *in vitro* a Băncii de Gene Suceava. În acest scop a fost folosit mediul de micropropagare Murashige-Skoog (MS-1962) cu adaos de 40 g/l zaharoză și 6 mg/l daminozidă. Efectul prelungirii perioadei de subcultură până la două și, respectiv, 12 luni a fost exprimat prin indicele mitotic și prin frecvența celulelor cu anomalii ale procesului de diviziune. Indicele mitotic a variat între 20,1 și 22,1 % după 12 zile, între 15,5 și 17,7 % după două luni și între 17,7 și 19,2% după 12 luni de subcultură. Rezultatele obținute au arătat că frecvența celulelor aberante a crescut odată cu prelungirea perioadei de menținere a culturilor *in vitro*, iar rata acumulării acestora a depins de genotip. Au fost identificate interfaze cu micronuclei, metafaze cu cromozomi restanțieri și ana-telofaze cu punți cromozomale, cromozomi restanțieri și fragmente cromozomale, dar procentul lor a fost mic la toate genotipurile.

Cuvinte cheie: *Solanum tuberosum* L.; varietăți locale; indice mitotic; *in vitro*.

THE EFFECT OF SORBITOL AND CONSERVATION PERIOD ON THE *IN VITRO* EVOLUTION OF *SOLANUM TUBEROSUM* L. PLANTLETS

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ABSTRACT. Local potato varieties are kept at Suceava Genebank, Romania, in the experimental field collection and *in vitro* by *slow growth* method which allows limited plantlets growth, thus prolonging the time between two subcultures. The paper presents some results concerning the influence of a growth inhibitor, namely sorbitol (as osmotic agent), in the development of plantlets belonging to five local varieties of potato (*Solanum tuberosum* L.), after different periods of *in vitro* storage, while reducing temperature and light intensity. During the experiment were evaluated several morphological aspects: number, length and branching of shoots, roots, number of viable nodes and number of viable shoots. The observations revealed that there has been registered a growth retardation of inoculums, while maintaining their viability and vitality. Although there were differences in growth patterns of these five potato varieties, as a general rule, the main effects of growing conditions has been a reduced plantlets height (2-4 cm) by the shortening of internodes and the contraction of leaflets size, to 1.5-2 mm. The results obtained during *in vitro* conservation for 17 months, of five local potato varieties on MS medium with 40 g/l sorbitol (C₂₄ culture media), recommend this solution for a wider use in the preservation of potato collection from the Suceava Genebank.

Key words: Potato; Local varieties; Sorbitol; Slow growth.

REZUMAT. Efectul sorbitolului și al perioadei de conservare asupra evoluției *in vitro* a plantulelor unor varietăți locale de *Solanum tuberosum* L. La Banca de Gene Suceava, varietățile locale de cartof sunt menținute în câmpul experimental și în colecția *in vitro* prin metoda *creșterii lente*, care limitează creșterea plantulelor, permițând, astfel, prelungirea duratei dintre două subculturi. Lucrarea prezintă o parte din rezultatele referitoare la influența unui inhibitor de creștere, respectiv sorbitolul (ca agent osmotic), asupra evoluției plantulelor a cinci varietăți locale de cartof (*Solanum tuberosum* L.), după perioade diferite de conservare *in*

in vitro, concomitent cu reducerea temperaturii și a intensității luminoase. În timpul experimentului au fost evaluate o serie de aspecte morfologice: numărul, lungimea și ramificarea lăstarilor, înrădăcinarea, numărul de noduri viabile și numărul de lăstari viabili. Observațiile efectuate au relevat faptul că s-a obținut o încetinire a creșterii inoculilor, concomitent cu păstrarea viabilității și a vitalității lor. Deși s-au înregistrat diferențe în tipul de creștere a celor cinci varietăți de cartof, efectul principal al condițiilor de cultivare a fost reducerea înălțimii plantulelor (2-4 cm) prin scurtarea internodiilor, precum și reducerea dimensiunii frunzulițelor, care au devenit solziforme (1,5 – 2 mm). Rezultatele obținute în cursul conservării *in vitro*, timp de 17 luni, a celor cinci varietăți locale de cartof pe mediul MS, cu 40 g/l sorbitol (mediul C₂₄), recomandă această soluție pentru o folosire la scară mai largă în prezervarea colecției de cartof de la Banca de Gene Suceava.

Cuvinte cheie: cartof; varietăți locale; sorbitol; creștere lentă.

STUDIES ON TREATMENTS RESULTS FROM COWS WITH OVARIAN DISORDERS IN RELATION TO YEAR AND SEASON

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ABSTRACT. The studies were performed in the dairy farm from Dancu Research and Development Station for Cattle Breeding, Iași, Romania, for a period of 5 consecutive years (2007- 2011), an effective annual rolled of 450 cows Bălțată cu Negru Românească (Romanian Black Spotted) breed. The experimental groups were composed of cows with anoestrus in 60 days postpartum interval, diagnosed by rectal examination with various ovarian disorders: persistent corpus luteum - group E1-162 cows and luteal cysts- group E2-138 cows. The treatments according to diagnosis were applied: PGF_{2α}-500 mcg/cow- group E1 and Gn-RH, (Receptal, 5 ml/cow-group E2). In relation to the year in which treatments were applied some variations in reproduction indices were found. Regarding to average intervals from treatment to first insemination and from treatment to conception respectively, significant differences were not found. Regarding to average conception rates after treatments, significant differences were found: in E1 group, conception rate at the first insemination was 30,9% (with annual variations between 15,0% in 2008 and 41,1% in 2009) ($p < 0,01$); per total insemination was 64,42 % (with annual variations between 44,7% - 2011 and 76,9% - 2007) ($p < 0,001$) and pregnancy index was of 2,4 (with annual variations between 1,9 - 2009 and 2,8 – 2008); in E2 group, conception rate to first insemination was 25,96% (with annual variations between 16,66% - 2011 and 40% - 2010) ($p < 0,01$); per total insemination was 77,88% (with annual variation between 52,17% - 2008 and 85,0% - 2010) ($p < 0,001$) and pregnancy index of 2,4 (with annual variations between 2,1 - 2007 and 2,6 - 2008 and 2009). In relation to season in which treatments were applied, we found different variations in conception rates: in group E1, the average conception rates at the first insemination were between 24,24 % (autumn) and 40,7% (summer) ($p < 0,05$) and per total inseminations between 75,0% (spring) and 85,71% (autumn) ($p < 0,05$); in group E2, the average conception rates at the first insemination were between 5,3% (summer) and 48,5% (spring) ($p < 0,001$) and per total inseminations between 68,4% (summer) and 81,8% (spring) ($p < 0,05$). We believe that annual and seasonal variations found in this work are due to some deficiencies of management system in dairy farms, such as the stalls prolonged maintenance and lack of active movement in the cold season, inadequate microclimate of shelters, heat stress and deficiencies in cows feeding, especially those with higher milk production.

Key words: Dairy cows; Anoestrus; Treatment; Persistent corpus luteum; Ovarian cyst; Year; Season.

REZUMAT. Studii privind rezultatele tratamentelor la vaci cu tulburări ovariene în funcție de an și sezon. Studiile au fost realizate în ferma de vaci de lapte de la Stațiunea de Cercetare-Dezvoltare pentru Creșterea Bovinelor Dancu, Iași, pe o perioadă de 5 ani consecutivi (2007-2011), pe un efectiv rulat anual de 450 de vaci din rasa Bălțată cu Negru Românească. Loturile experimentale au fost alcătuite din vaci cu anestrus în perioada de 60 zile postpartum, diagnosticate prin examen transrectal cu diferite tulburări ovariene: corp luteal persistent - lot E1-162 capete și chiști luteinici, lot E2-138 capete. Tratamentele au fost aplicate conform cu diagnosticul stabilit: PGF2 α - 500 mcg/vacă - lot E1 și Gn-RH, (Receptal, 5 ml / vacă) - lot E2. În funcție de anul în care tratamentele au fost aplicate s-au constatat unele variații privind indicii de reproducție realizați. În privința intervalelor medii de la tratament la prima inseminare și, respectiv, până la concepție nu s-au constatat diferențe semnificative. În privința ratelor de concepție după tratament s-au constatat diferențe semnificative: în lotul E1, rata concepției la prima însămânțare a fost de 30,9% (cu variații anuale între 15,0% în 2008 și 41,1% în 2009 ($p < 0,01$)), pe total însămânțări a fost 64,42% (cu variații anuale între 44,7% în anul 2011 și 76,9% în 2007 ($p < 0,001$)) și un indice de gestație în medie de 2,4 (cu variații anuale între 1,9 - 2009 și 2,8 - 2008); în lotul E2, rata concepției la prima însămânțare a fost de 25,96% (cu variații anuale între 16,66% - 2011 și 40,0% - 2010) ($p < 0,01$); pe total însămânțări a fost de 77,88%, (cu variații anuale între 52,17% - 2008 și 85,0% - 2010) ($p < 0,001$) și un indice de gestație în medie de 2,4 (cu variații anuale între 2,1 - 2007 și 2,6 - 2008-2009). În funcție de sezonul în care au fost efectuate tratamentele s-au constatat, de asemenea, variații în privința ratelor de concepție: în lotul E1, rata concepției la prima inseminare a variat între 26,66% (iarna) și 34,48% (vara), iar pe total inseminări, între 71,87% (primăvara) și 85,71% (toamna), cu diferențe statistice semnificative ($p < 0,05$); în lotul E2, rata concepției la prima însămânțare a prezentat variații între 5,3% (vara) și 48,48% (primăvara), iar pe total inseminări, valori medii cuprinse între 68,42% (vara) și 81,80% (primăvara) ($p < 0,001$). Considerăm că variațiile anuale și sezoniere constatate în prezenta lucrare sunt datorate unor deficiențe ale sistemului de management al fermei de vaci, cum ar fi sistemul de întreținere în stabulație prelungită și lipsa mișcării active în sezonul rece, microclimatul din adăpost, stresul caloric, precum și furajarea vacilor, în special a celor cu producții mai mari de lapte.

Cuvinte cheie: vaci de lapte; anestrus; corp luteal persistent; chiști ovarieni; tratament; an; sezon.