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An investigation on factors affecting seed dormancy in wild oats(*Avena ludoviciana* Durieu).

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ABSTRACT

Wild oat (*Avena ludoviciana* Durieu.) is one of the important weeds in winter wheat. Seeds produced by this plant are viable in soil for a long time and germinate gradually.

Physiological basis of wild oat seed dormancy was investigated. Results showed that complete germination of dormant seeds was obtained when the covering structures (glumels, pericarp, endosperm, aleurone layer) were removed. This shows that embryo may not be the main factor in dormancy and that it is non dormant. There are two factors that affect seed dormancy. The first is the presence of glumels that prevent seed germination mechanically and the second one is the aleurone layer in caryopsis. It causes dormancy by decreasing water potential in embryo.Using electrophoretic separation (SDS-PAGE), the protein composition of non dormant and dormant seeds were recognized. There were eight special polypeptide bands in dormant seeds, four of them had molecular weights of more than 66000 Da , and molecular weights of others were , 38695, 53380, 46505 and 20334 Da. However, in non dormant seeds 2 special polypeptide bands with molecular weights of 32197 and 25587 Da were observed. This may mean the presence of gene influence in seed dormancy and germination.

Key words : wild oats, seed, dormancy, germination, physiology.

References

ANGHEL,G. & RAIANA,M.1960. Germination of wild oats seeds under laboratory and filed conditions. An Inst Cerc Agron, Bucuresti, Ser 27: 83-95

ATWOOD, W.M.1914.A physiological study of the germination of *Avena fatua*.Bot, Gaz.57:386-414.

BAILIN, L. & FOLEY, M.E.1994. Differential polypeptide patterns in imbibed dormant and after ripened *Avena fatua* embroys.Journal of Experimental Botany, 45: 275-279.

BLACK, M.1959. Dormancy studies in seed of *Avena fatua* 1.Possible role of germination inhibitors. Can. J. Bot. 37: 393-402.

CONN, J.1990. Seed viability and dormancy of 17 weed species after burial for 4.7 years in Alaska. Weed Science 38: 134-138.

ESNO,H.; SOLNA,H. and SWEDEN, M. 1966. Proceedings of the International seed Testing Association. Wageningen. (Netherlands), P: 92.

GOMORI, G. 1955. Preparation of buffers for use in enzyme studies. Methods in enzymology. 1 : 138 – 146.

HSIAO, A.I. 1979.The effects of sodium hypochlorite, gibberellic acid, and light on seed dormancy and germination of wild buckweet (*Polygonum convolvulus*) and cow cockle.(*Saponaria vaccaria*). Canadian Journal of Botany 57: 1735-1739.

HSIAO, A.I. ; Mc INTYRE, G.I. & HANES, J.A.1983. Seed dormancy in *Avena fatua*. I.Induction of germination by mechanical injury.Bot. Gaz.144: 217-222

JOHNSON, L.P.V. 1935. General preliminary studies on the physiology of delayed germination of *Avena fatua*. Can. J. Res C-D 13: 283-300

METZJER,J.D.1992. Physiologycal basis of achene dormancy in *Polygonum convolvulus* (Polygonaceae). American Journal of Botany 79: 882-886.

NAYLOR, J.M. &, CHRISTIE , L.A. 1957.The control of dormancy in wild oats. Proc 10th Meet. West. Sect. Nat. Weed Comm. Can. 56-59.

NAYLOR,J.M.1966. Dormancy studies in seed of *Avena fatua* 5. On the response of aleuron cells to gibberellic acid. Can. J.Bot. 44: 19-22.

RAJU, M.V.S. & HSIAO , A.I,MC INTYRE, G.H. 1986. Seed dormancy in *Avena fatua*. III. The effect of mechanical injury on the growth and development of the root and scutellum, Bot. Gaz. 147: 443-452.

RAJU, M.V.S & WINNIE, T. 1986.The role of the aleurone layer in the germination of caryopsis of wild oats (*Avena fatua L.*). J.Plant. Morph. 3: 77-84

RAJU, M.V.S. & WALTER, A. 1988. Heterogeneity and behaviour of aleurone cell in the caryopsis of wild oats (*Avena fatua*). Flora. 180 : 417-427.

SALIMI,H. and GHORBANLI, M. 2001. A study on seed germination of *Avena ludoviciana* and the effective factors in seed dormancy breaking. Rostaniha. 2 : 41 – 55.

SIMMONDS, J.A & SIMPSON,G.M.1971. Increased participation of pentose phosphat pathway in response to after ripening and gibberellic acid treatment in caryopsis of *Avena fatua*. Can. J. Bot. 49 : 1833-1840.

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Fumigant toxicity and repellency of the essential oil of *Artemisia aucheri* on four species of stored pests

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ABSTRACT

Fumigation toxicity and repellency of essential oil of *Artemisia aucheri* Boiss (Asteraceae) was investigated on four species of stored products pests including: *Callosobruchus maculatus* F.(Col.; Bruchidae), *Tribolium castaneum* Herbst (Col.; Tenebrionidae), *Sitophilus oryzae* L., *Sitophilus granarius* L. (Col.; Curculionidae) at 30 ± 2 °C, 60 ± 5 r. h. under dark condition. After 48 h. of fumigation, mortality of adult insects was found to increase as the essential oil concentration increased. At the highest concentration of essential oil (0.926 µl / cm^3) mortality was recorded 84.41, 85.41, 84.70 and 83.04 % for *C. maculatus, T. castaneum, S. oryzae*and *S. granarius,* respectively. During 3, 6 and for 9 h. after fumigation adult insects of *C. maculatus* with 20.33, 35.70 and 47.96 % mortality were found more susceptible than other species. LC_{50} values of essential oil were found to be 0.1074, 0.1221, 0.1277 and 0.1389 µl / cm^3 for *C. maculatus, T. castaneum, S. oryzae* and *S. granarius,* respectively.The essential oil significantly repelled insects and at 0.03 µl / cm^3 caused 41.99, 51.45, 47.31 and 46.31% repellency for *C. maculatus, T. castaneum, S. oryzae* and *S. granarius,* respectively. Repellency of the essential oil for all tested species was found to increase as its concentration was increased.

Key words: Essential oil, *Artemisia aucheri,* Stored products pest, Repellency, Fumigation

References

AJAYI, F. A. and LALE, N. E. S. 2001. Susceptibility of unprotected seeds of local bambara groundnut cultivars protected with insecticidal essential oils to infestation by *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae). Journal of Stored Products Research, 37: 47 – 62.

ARUNK, T., VEENA, P., KISHANK, A. and SUSHIL, K. 2001. Insecticidal and ovicidal activity of the essential oil of *Anethum sowa* Kurz against *Callosobruchus maculatus* F. (Coleoptera: Bruchidae). Insect Science and its Application, 21 (1): 61-66.

BAGHERI ZONOUZ, A. 1987. Coleoptera pests on industrial crops. Vol 1, Sepehr Publishing Co., 309 pp.

BEKELE, J. and HASSANALI, A. 2001. Blend effects in the toxicity of the essential oil consitituents of *Ocimum kilimandscharium* and *Ocimum kenyense* (Labiateae) on two post – harvest insect pests. Phytochemistry, 57: 385 – 391.

DUNKEL, F. V. and SEARS, J. 1998. Fumigant properties of physical preparations from mountain big sagebrush, *Artemisia tridentata* Nutt. ssp. *Vaseyana* (Rydb.) beetle for stored grain insects. Journal of Stored Products Research, 34(4): 307-321.

ENAN, E. 2001. Insecticidal activity of essential oil: Octopaminergic sites of action. Comparative Biochemistry and Physiology Part C, (130): 325-337.

FIELDS, P. G., XIE, Y. S. and HOU, X. 2001. Repellent effect of pea (*Pisum sativum*) fractions against stored – product insects. Journal of Stored Products Research, 37: 359 – 370.

HAGHIGHIAN, F. and JALALI SENDI, J. 2002A. Comparative study on the growth inhibitor effect of *Artemisia annua* L. and *Sambucus ebulus* L. extract on stored product beetle *Tribolium confusum* Duv. 15th Iranian Plant Protection Congress, P 81.

HAGHIGHIAN, F. and JALALI SENDI, J. 2002B. Comparative study on repellency effect of *Artemisia annua* L. and *Sambucus ebulus* L. extract on stored product beetle *Tribolium confusum* Duv. 15th Iranian Plant Protection Congress, P 81.

ISMAN, M. B. 2000. Plant essential oils for pest and disease management. Crop Protection, 19: 603 –608.

JALALI, J., ETTEBARY, K., ALIAKBAR, A. and EBRAHIMI, K. 1998. Insecticidal effects of aqueous leaf extracts of Ground – Elder *Sumbus ebulus* and Worm – Wood, *Artemisia annua* on rice weevil *Sitophilus oryzae*. 13th Iranian Plant Protection Congress, P 41.

KEITA, S. M., VINCENT, C. SCHMIDT, J. P. and ARNASON, J. T. 2001. Insecticidal effects of *Thuja occidentalis* (Cupressaceae) essential oil on *Callosobruchus maculatus* (Coleoptera: Bruchidae). Canadian Journal of Plant Science, 81(1): 173 – 177.

MATSUMURA, F. 1985. Toxicology of insecticides. Plenum Press. 598 pp.

MODARRES, S. S. 2002. Damage assessment of stored product pest of wheat and barley in Systan region. 15th Iranian Plant Protection Congress, P 85.

OGUNWOLU, E. O. and ODUNLAMI, A. T. 1996. Suppression of seed bruchid (*Callosobruchus maculatus* F.) development and damage on cowpea (*Vigna unguiculata* (L.) Walp.) with *Zanthozylum zanthoxyloides* (Lam.) Waterm. (Rutaceae) root bark powder when compared to neem seed powder and pirimiphos – methyl. Crop Protection, 15 (7): 603 – 607.

OWUSU, E. O. 2001. Effect of some Ghanaian plant components on control of two stored – product insect pests of cereals. Journal of Stored Products Research, 37: 85 – 91.

PARK, I. K., LEE, S. G., CHOI, D. H., PARK, J. D. and AHN, Y. J. 2003. Insecticidal activities of constituents identified in the essential oil from leaves of *Chamaecyparis obtusa* against *Callosobruchus chinensis* (L.) and *Sitophilus oryzae* (L.) . Journal of Stored Products Research, 39(4): 375 – 384.

PASCUAL–VILLALOBOS, M. J. and ROBLEDO, A. 1999. Anti – insect activity of plant extracts from the wild flora in southeastern Spain. Biochemical Systematics and Ecology, 27: 1 – 10.

PRATES, H. T., SANTOS, J. P., WAQUIL, J. M. and FABRIS, J. D. 1998. Insecticidal activity of monoterpenes against *Rhyzopertha dominica* (F.) and *Tribolium castaneum* (Herbst). Journal of Stored Products Research, 34 (4): 243 – 249.

RAHMAN, M. M. and SCHMIDT, G. H. 1999. Effect of *Acorus calamus* (L .) (Aceraceae) essential oil vaporous from various origins on *Callosobruchus phaseoli* (Gyllenhal) (Coleoptera: Bruchidae). Journal of Stored Products Research, 35: 285 – 295.

RAJA, N., ALBERT, S. IGNACIMUTHU, S. and DORN, S. 2001. Effect of plant volatile oils in protecting stored cowpea *Vigna unguiculata* (L.) Walpers against *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae) infestation. Journal of Stored Products Research,37: 127 – 132.

RAJAPAKSE, R. and VAN EMDEN, F. 1997. Potential of four vegetable oils and ten botanical powder for reducing infestation of cowpeas by *Callosobruchus maculatus*, *C. chinesis* and *C. rhodesianus*. Journal of Stored Products Research, 33(1): 59-68.

SHAAYA, E., KOSTJUKOVSKI, M., EILBERG, J. and SUKPRAKARN, C. 1997. Plant oils as fumigants and contact insecticides for the control of stored – product insect. Journal of Stored Products Research, 33(1): 7-15.

TAPONDJOU, L. A., ADLER, C., BOUDA, H. and FONTEM, D. A. 2002. Efficacy of powder and essential oil from *Chenopodium ambrosioides* leaves as post – harvest grain protectants against six–stored product beetles. Journal of Stored Products Research, 38: 395 - 402.

TRIPATHI, A. K., PRAJAPATI, V., AGGARWAL, K., KHANUJA, S. P. S. and KUMAR, S. 2000. Repellency and toxicity of oil from *Artemisia annua* to certain stored – product beetles. Journal of Economic Entomology, 93(1): 43 – 47.

TUNC, I., BERGER, B. M., ERLER, F. and DAGLI, F. 2000. Ovicidal activity of essential oils from plants against two stored – product insects. Journal of Stored Products Research, 36: 161–168.

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