Journal of Medicinal Plants Research Vol. 5(20), pp. 5017-5020, 30 September, 2011
Available online at http://www.academicjournals.org/JMPR
ISSN 1996-0875 ©2011 Academic Journals

Full Length Research Paper

The effects of sage volatile oil (*Salvia officinalis*) and Turkish oregano volatile oil (*Origanum onites*) on stored cowpea (*Vigna nisensis L.*) seed

Demet ALTINDAL* and Nüket ALTINDAL

Suleyman Demirel University Faculty of Agriculture, Department of Field Crops, Turkey.

Accepted 2 August, 2011

Physical and biological quality of seed is a very important activity when cowpea seed have to be stored for long time. The treatment of chemicals inhibitors in stores is a common practice to prevent the quality of seed. The effects of different concentrations (0, 250, 500, 1000 and 2000 ppm) sage (*Salvia officinalis)* and Turkish oregano (*Origanum onites*) on cowpea seeds in stroge. The study was arranged in factorials with 4 replications and of variance was done using statistical analysis system (SAS) software. The data collected included the rate of damaged seeds, weight loss percentage in seed, seed germination. The highest rate of damaged seeds, weight loss in seed was obtained on untreatment volatile oil. The highest seed germination was obtained on 250, 500 and 1000 ppm sage volatile oil and Turkish oregano volatile oil treatment.

Key words: Cowpea, sage, seed, stroge,Turkish oregano, volatile oil.

INTRODUCTION

Cowpeas are one of the more important indigenous Turkey legume crops. The practice of cereal-cowpea intercropping and crop rotation coupled with effective soil fertility management can increase yields of cereals succeeding cowpea. It is widely grown in Turkey forming the main source of protein. Cowpea seeds is restricted by a number of biotic as insect pests and abiotic factors both in the field and the seed in storage. Feeding pests with stored products, product quality by reducing the weight and germination capacity are caused to fall (Karci, 2006). Grain loss during and after harvest is a major problem in agricultural production in developing countries. Insect pests, rodents, and micro-organisms comprise the larger proportion of post-harvest losses. Storage fungi are known to be the dominant causes of post-harvest deterioration of cereals, legumes and oilseeds in the world (Bothast, 1978), mostly Aspergillus and Penicillium species (Mathur and Jørgensen, 1992; Shashidhar et al., 1992). Stored seeds are extremely susceptible to Bruchid beetles. Bruchid beetles attack legume seeds and cause severe damage in the quality and quantity of the crop. They attack bean before or during harvest as well as in storage causing a serious damage (Eltayeb, 2000; Dal Bello et al., 2001).

After harvest, the infested seeds were transmitted to stores where development of beetles is completed (Mukherjee and Joseph, 2000) and this insect is a storage problem. Their damage causes loss of weight, nutritional value and viability of stored grains (Swella and Mushobozy, 2007). There is a growing interest in the exploitation of naturally occurring for the control of crop pests. Biological control agents (BCA) may offer more environmentally safe alternatives to chemical pesticides. Volatile oils may have attractive or repellent effects and an insecticidal action against insects. Volatile oils isolated from plants and consisting of cyclic and monocyclic mono-terpenes are effective repellents against insects (Mishra et al., 2007). In the past few years, several studies have focused on the potential use of volatile oil applications in biological control of different insect pests. The essential oils may be more rapidly degraded in the environment than synthetic compounds and some have increased specificity that favors beneficial insects

*Corresponding author. E-mail: daltin@ziraat.sdu.edu.tr or daltindal@gmail.com. Tel: 902462114663. Fax: +902462371693.

Abbreviations: BCA, Biological control agents; **RH,** relative humidity; **ANOVA,** analysis of variance.

Table 1. The volatile oil components in plants.

Volatile oil plants	Volatile oil ratio (%)	Compounds
Turkish oregano	2.6	Carvacrol (87.2%), γ-terpiene (4.0%), p-cymene (3.1%)
Sage	1.7	α-thujone (23.0%), Camphor (21.3%), β-thujone (13.6%)

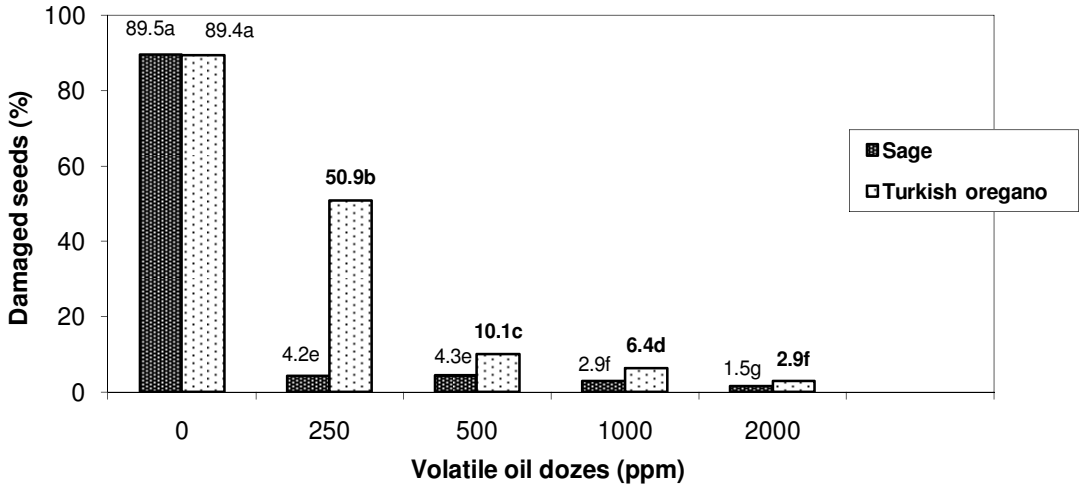

Figure 1. Effect of volatile oil x dozes on damaged seed (LSD (%1): 0.53).

(Pillmoor et al., 1993). Their action against stored product insects has been extensively studied.

Moreover, these natural derivatives are considered to be an alterna-tive means of controlling harmful larvae of Lepi-doptera. Recent research has demonstrated their larvicidal and antifeeding effects (Bathal et al., 1993; Larocque et al., 1999). The present study aimed to explore the protective capacity of some plant volatile oils against the cowpea beetle in laboratory.

MATERIALS AND METHODS

This study was conducted in the laboratory of the Department of Field Crop of Süleyman Demirel University of Agriculture, Isparta /Turkey. The experiments were designed by randomized parcels and analysed statistically by the analyses of variance (ANOVA) and multiple comparison at the 1% level. The cowpea seeds were stored in to pots containing volatile oil (sage and Turkish oregano) under laboratory conditions. They were maintained on cowpea in four large jars, each with a capacity of 100 g. The jars were covered with perforated lids and kept in an incubator maintained at a temperature of 30 ± 1°C and 70 ± 2% relative humidity (RH). The seeds were treated by 250, 500, 1000 and 2000 ppm of volatile oil previously deposited on the mouth of the jars, and were later placed in the Eppendorf tube. After 28 days, the bruchids were separated from the seed. The two medicinal plants used in this study were as Sage (*S. officinalis*) and Turkish oregano (*O. onites*). Volatile oil obtained from plants using the clevenger-type apparatus was carried out with hidrodistilasyon method. Air-dried material (each about 100 g) were separately ground into small pieces and subjected to hydrodistillation for 3 h using a Clevenger-type apparatus. Volatile oils were kept in a refrigerator under darkness conditions until needed for experiments. The volatile oil components were identified by GC/MS (Table 1). For each type of volatile oil, four different concentrations (250, 500, 1000 and 2000 ppm) and for each concentration three replicates were used. Table 1 reports the essential oil compound of the plant species and the main constituents of each oil used. The composition of the examined oils is very complex since they are made up of several compounds of different characteristics. Briefly, Turkish oregano contain high levels of carvacrol (87.2%), mainly γ-terpiene (4.0%) and p-cymene (3.1%) are always found as major monoterpene hydrocarbons. Sage oil is mainly composed of monoterpene ketones α-thujone (23.0%), camphor (21.3%) and β-thujone (13.6%).

RESULTS AND DISCUSSION

Damaged seeds percentage

Effects of doses differed according to volatile oil source of storage period. According the damaged seeds percentage differences between volatile oil doze were statistically significant (*P<0.01*). Turkish oregano oil was more responsive to damaged seed than sage oil. The highest damaged seed was obtained for Turkish oregano oil (50.9b) treatment in 250 ppm after untreatmant (89.5a and 89.4a). (Figure 1). The highest damaged seed was obtained for Turkish oregano oil (50.9b) treatment in 250 ppm. The lowest damaged seeds was obtained from using sage oil (1.5 g) in 2000 ppm (Figure 1).

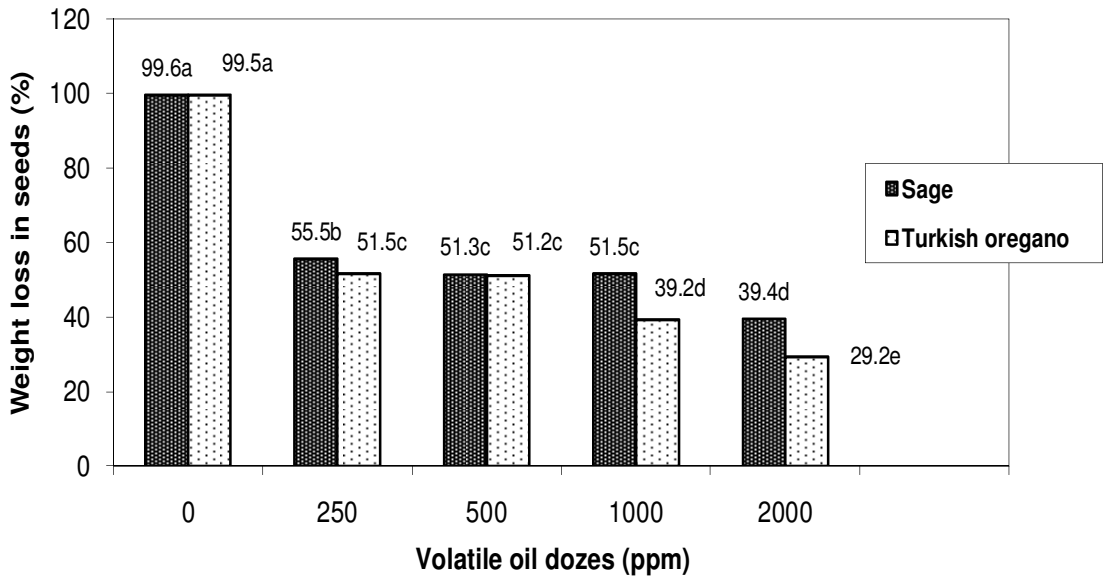

Figure 2. Effect of volatile oil x dozes on weight loss in seed (LSD (%1): 0.48).

Weight loss percentage in seed

To determine the impact of storage period on weight loss in the studied cultivars, samples of seeds were tested and as previously aforementioned after harvest and weight loss was calculated according to Harris and Lindblad (1978):

$$\text{Weight loss \%} = \frac{(wu \times nd) - (wd \times nu) \times 10}{Wu\ (nd + nu)}$$

Wd = weight of damaged seeds, nu = number of undamaged seeds, wu = weight of undamaged seeds, nd = number of damaged seeds.

Data were subjected to ANOVA and means were compared by a least significant different test. Effects of doses differed according to volatile oil source in weight loos in seed of storage period. According the weight loos in seed percentage, differences between volatile oil doze were statistically significant (*P<0.01*). Sage oil was more responsive to weight loos in seed than Turkish oregano oil. The highest weight loos in seed was obtained for sage oil (55.5b) treatment in 250 ppm after untreatments (99.6a and 99.5a) The lowest weight loos in seed was obtained from tyme oil (29.2e) treatment in 2000 ppm (Figure 2).

Seed germination ratio percentage

Cowpea seeds was transferred separately to pre-sterilized 9 cm diameter Petri dishes containing sterilized filter paper, on which 30 seeds of cowpea were placed. Then the Petri dishes were sealed with parafilm and incubated at 25 ± 1°C for 8 day. The seed germination was recorded at intervals of 8 day. Seeds were considered germinated upon radicle emergence. The final germination ratio was obtained after 8 day. Seed germination ratio percentage according to interaction among volatile oils, volatile oil doses were 250, 500, 1000 and 2000 ppm in sage oil treatment (98,3a- 100.0a- 100.0a and 100.00a) using Turkish oregano oil for 250, 500 and 1000 ppm (100,0a- 100.0a- 100.0a) difference in seed germination was statistically important (Figure 3). Morever, lowest seed germination were in volatile oil untreatment (90.00c).

In the recent years use volaltile oil as pesticides is very important activity in stored seed. Oils of plant materials have been found to be alternatives for the control of stored product insect pests (Okunolae et al., 2007). Some are used in essential oil of medical plants as natural inhibitors in stored seed. It was found that cowpea storge was inhibited especially by sage and also by the Turkish oregano volatile. Our study has demonstrated that the use of sage volatile oil could improve the cowpea storage. Simple and cheap treatment of sage oil treatment (2000 ppm) in 100 g of grain cowpea. Negative effect on damaged seed, weight loos in seed and seed germination ratio in volatile oil untreatments. Because to include carvacrol in Turkish oregano may have been higher damaged grain rate and weight loss in seed according to sage oil treatment. In any event, the effectiveness of volatile oils, containing volatile compounds, will depend on the storage. Still, the most effective dose and the outcome of such application in a storage situation using volatile oil amounts of cowpea seeds can be shown more precisely.

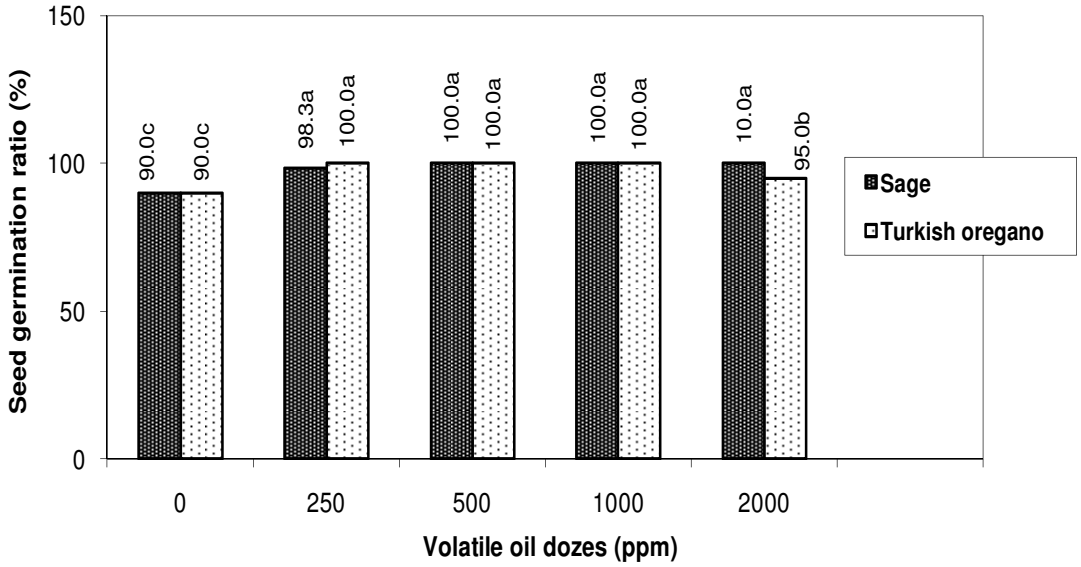

Figure 3. Effect of volatile oil x dozes on seed germination (LSD (%5): 1.73).

REFERENCES

Bathal SS, Singh D, Dhillon RS (1993). Effect of crude root oils of *Inula racemosa* and *Saussurea lappa* on feeding, survival and development of Spodoptera litura (*Lepi-doptera: Noctuidae*) larvae. Eur. J. Entomol., 90(2): 239-240.

Bothast RJ (1978). Fungal deterioration and related phenomena in cereals, legumes and oilseeds. In: Post-harvest biology and biotechnology, (eds. Hultin, H.O. and Milner, M.), Food and Nutrition Press, Inc.: Westport, Connecticut, USA, pp. 210-243.

Dal BG, Pnadin S, Lopez IC, Fabrizio M (2001). Laboratory evaluation of chemical-biological control of the rice weevil (*Sitophilus oryzae* L.) in stored grains. J. Stored Prod. Res. 37, 77-84.

Eltayeb AE (2000). Detterent effect eof some botanical products on oviposition of the cowpea bruchid callosobruchus maculates (F.) (Coleoptere: Brucdidae). Int. J. Pest Manag., 46: 109-113.

Harris KL, Lindblad GZ (1978). Post harvest grain assessment methods. American Association of Cereal chemicals, St. (Plant Minnesota, p. 193).

Karci A (2006). Some Essential Oils Bit Crushing Plant Origin of flour, TriboliumConfusum Duval, (Col.: Tenebrıonıdae) flour against a ll development stages of the Impact of fumigants. Imam University, Kahramanmaras Dairy Science Department of Plant Protection Institute, S 55 Kahramanmaras.

Larocque N, Vincent C, Belanger A, Bourassa JP (1999). Effects of tansy essential oil from Tanacetum vulgare on biology of oblique-banded leafroller, Choristoneura rosaceana. J. Chem. Ecol., 25(6): 1319-1330.

Mathur SB, Jørgensen J (1992). Seed Pathology, Proceedings of the CTA Seminar Held at Copenhagen, Denmark, on 20-25 June 1988. CTA: The Netherlands. p. 412.

Mishra D, Shukla AK, Tripathi KK, Singh A, Dixit AK, Singh K (2007). Efficacy of application of vegetable seed oils as grain protectant against infestation by Callosobruchus chinensis and its effect on milling fractions and apparent degree of dehusking of Legume-Pulses. J. OLEO Scı., 56(1): 1-8.

Mukherjee SN, Joseph M (2000). Medicinal plant extracts in fluencing insect growth and reproduction. J. Med. Arom. Plant Sci., 22: 38.

Okunola CO, Okunola AA, Abulude FO, Ogunkoya MO (2007). Organoleptic Qualities of Maize and Cowpea stored with some Essential oils. Afr. Crop Sci. Conf. Proc., 8: 2113-2116.

Pillmoor JB, Wright K, Terry AS (1993). Natural products as a source of agrochemicals and leads for chemical synthesis. Pestic Sci., 39: 131-140.

Shashidhar RB, Ramakrishna Y, Bhat RV (1992). Moulds and mycotoxins in sorghum stored in traditional containers in India. J. Stored Prod. Res., 28: 257-260.

Swella GB, Mushobozy DMK (2007). Evaluation of the efficacy of protectants against cowpea bruchids (*Callosobruchus maculatus* (F.)) on cowpea seeds (*Vigna unguiculata* (L.) Walp.). Plant Protect. Sci., 43: 68-72.