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Review on Use of Botanical Plants and Local Material Products in Stored Grain Pest Management

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Abstract
In the present review article, the use of botanical pants and local material product has been seen by many as an alternative way of promoting development in poor rural communities in many parts of the world. In earlier times various botanical pants and local material products were used for storage pests. The shelf life or storage span of items was increased using readily available and low cost items like botanical plants and other different plant material products and they are the common methods adopted by majority of the rural farmers for storing the grains although majority of them are not aware of the reasons or qualities of these materials and are using them as age old wisdom. So it can be concluded that many of the botanical pants and local material product find credibility even in today's period. Moreover, their user-friendly approach, local availability associated with scientific reasoning provides enjoyment and satisfaction to the users. It must therefore be encouraged to use only those eco-friendly practices that are known to be both safe and effective. These practices must be modified to make them more efficient for further transfer to the end users in the future**.**
Key words: botanical plants; local material; storage pests, management
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Introduction

Post-harvest losses are one of the major causes of food insecurity in the developing world. In Africa, at the farm level, producers store their grains for three purposes: for consumption until the next harvest, as seed for planting in the next season and for selling when prices become favorable. In many developing countries, including in Ethiopia, grain storage practices involve traditional structures, which are largely ineffective in the prevention of deterioration of stored products (Abraham, 19965).

Among the key constraints to improving food security in Africa are losses resulting from poor post-harvest management of grains (Charles et al., 2016). The average grain losses due to storage pests about 12% of the total grain produced in some case the losses could be rise to 50% (Gabriel and Hundie, 2006). Deterioration of stored grains results from the interactions of several factors such as physical, chemical and biological variables existing the overall chains from production to consumptions. Deterioration of grain due to infestations of insects, mites, and fungi is the main post-harvest factor affecting the nutritional quality and marketability of stored grain (Dubale et al., 2012).

Grain storage pests are major concerns for farmers worldwide but especially in developing countries because large percentage of the crop may be lost to storages pests. Prior to any pest control interventions, it is vital to assess the pest status and extent of losses that have occurred or likely to occur during storage (Togola et al., 2015).

The grain weevils (Sitophilus spp.) and the Angoumois grain moth (*Sitotroga cerealella*) on cereals and three genera of bruchids (*Acanthoscelides, Zabrotes* and *Callosobruchus*) on legumes are the most important pests of stored grain in Africa. Crop losses due to storage pests are usually below 5% in traditional agriculture in Africa and elsewhere (Compton, 1993). However, this situation is changing due to the introduction of high-yielding crop varieties that are usually more susceptible.

The importance of appropriate and readily available post-harvest storage practices for agricultural crops cannot be overemphasized in any development plan for increased food production and enhancement of food security. Adequate storage of farm produce remains paramount for preservation of farm produce for future consumption. Lack pesticides and development insect resistances, scientists have research into various alternatives. Phillip and Throne (2010) reviewed the alternative to the use of pesticides and classified them into groups; strategies based on the manipulation of the physical environment or on biological based products.

Communal smallholder farmers use different kinds of plant products to control storage grain pests. The precise strategy used these farmers varies from place to place and appears to depend partly on the type and efficacy of suitable material available in different location (Greenberg and Showler, 2005). Moreover, the botanical plants and plant products are generally pest-specific and are relatively harmless to non-target organisms including man. They are also biodegradable and harmless to the environment. Considering above problems and facts the present the objective of this review is to evaluate the effectiveness of different botanical plant and plant product for management of storage pests to be adopted by resource poor farmers that best fit the biophysical, economic and socio-cultural conditions of storage pests control.

Review of important botanical plant and plant product in storage pests' management

Leaf extract of all the plants (Prosophis sp., Nerium sp., Ocimum sp., Acalypha sp., Catharanthus sp., and Vitex sp.) caused significant ovipositional deterrent effect aginst pulse beetle. Leaf extract of Vitex sp. leaf extract caused maximum reduction in egg viablity (61.7%) followed by *Catheranthus* sp. leaf extract (56.7%). Vitex sp treated seeds at 5% level caused maximum reduction in adult emergence (85.0%) followed by *Catheranthus* sp. (83.7%), Acalypha sp. (73.3%), *Nerium* sp. (70.0%), *Ocium* sp. (68.7%) and minimum reduction was recored in case of Prosphis sp. (68.0%) (Sathyseelan et al., 2008). Another study by (Derbalah 2012) revealed that, the tested botanical extracts (*Cassia senna, Caesalpinia gilliesii, Thespesia populnea var. acutiloba, Chrysanthemum frutescens, Euonymus japonicus, Bauhinia purpurea*, and *Cassia fistula*) showed high efficiency against T. *granarium* with respect to mortality and progeny of the adults. C. senna was the most effective botanical extract against T. *granarium*

Wale and Patil (2020) also reported that to control storage pest, mixing the dried leaves of neem with seeds. Mixing sorghum seeds with ash to prevent storage pests. Mixing the green gram seeds with sand before storage. Milled chickpea, green gram and other pulses are stored after thoroughly treated with mustard oil. For the protection of the storage pests, farmers have been using botanicals including neem, tobacco and eucalyptus leaves and seeds and inert material like sand, salt and ash (Chomchalow, 2003).

Research result by (Sorri, 2014) study showed that three plant products (*Chenopodium*, *Nicotinia*, *Maesa lanceolota)* have high efficacy in controlling weevil by causing adult weevil mortality (23-67%) and reducing emergence of new progeny emergence from 80 % to 28% (*Chenopodium)* 36% (*Nicotinia)* and 40% (*M. lanceolota).* It was also noticed that 68 % of the farmers had used cultural practices and locally available plant materials as for the control of stored sorghum insect pests' storage (Chemeda et al., 2007).

Makanjuola, (1989) gives a good account of laboratory investigations and field trials in Nigeria that tested other materials from the neem tree, including water-based leaf extracts, for the protection of cowpeas and maize. The results showed good protection of cowpeas (against C. *maculates*) for five months but only moderate protection of maize and found that seed extracts were more effective than leaf extracts.

Biological products of the plants may affect activities of the different arthropods including storage pests. Plants having some insecticidal properties have been exploited since long past to protect stored products from insect pests (Belmain and Stevenson, 2001). Some of the metabolites of plants are toxic such as pyrethrum, nicotine, rotenone etc. and some are repellents, antifeedants like azadirachtin, rape seed extract and others, like Acorus calamus act as sterilants (Ignatowicz and Wesolowska, 2015).

Different workers (Su,1977; Williams, 1983; Olafa and Erhun,1988; Osisiogu and Agbakwuru ,1988; Okoronkwo and Okoye, 1996) have confirmed that effectiveness of different botanical against storage pests.

The Neem tree Azadirachta indica, belonging to the family Meliaceae originating from the Indian subcontinent, is a well-known example of one of the plants with potential to serve as an anti-feedant against insects and pests. Other examples include *Detarium microcarpum, Sclerocarya birrea, Piper guineense* as seed protectants for maize (Sitophilus zeamais), Cassia nigricans Vahl oil and the plant as grain protectants of stored wheat weevil, Tribolium casteneum, as well as containing biologically active compounds, that may serve as candidates for new formulations in the treatment and prevention of livestock diseases and pest management (Ayo, 2010);

Emana (1997) compared wood ash, sand, tobacco dust, saw dust, neem seed powder and pirimiphos-methyl in the laboratory at Awassa (southern Ethiopia) and reported that tobacco dust was superior to all treatments in terms of damage caused by the Angoumois grain moth larvae and seed germination; followed by their mixtures. However, treatment with tobacco dust left undesirable taste on the grain (Emana, 1993; Emana and Assefa, 1998).

In other trial the author approved that storage pests can be effectively managed with using readily available and low cost items like (ash, sand, table salt, camphor, inner dust and dung) other different plant materials and they are the common method adopted by majority of the rural farmers (Dekeba,2022). The occasional use of abrasive mineral dusts, natural desiccants like wood ash and various plant materials with repellent or insecticidal properties is well known and documented (Golob, 1984).

Conclusion

The review articles concluded that the need for demonstrations and relevant training on the use of effective botanical plant and their product to storage pest control methods, and all found effective in management of storage pests in agriculture they need to be validated scientifically

Reference

Abraham T, (1995). Insects and other arthropods recorded from stored maize in western Ethiopia. ACSL 4(3):339343.

Belmain, S., and Stevenson, P. 2001. Ethnobotanicals in Ghana: reviving and modernizing age old farmer practice. Pest. Out, 12:233–38

Charles, A., Midega, O., Alice, A., Murage, W., Jimmy, B., Pittchar, O., Zeyaur, A., Khan, R, 2016. Managing storage pests of maize: Farmers' knowledge, perceptions and practices in western Kenya. Crop Protection. 90: 142-149

Chemeda, A., Abush, T., Zekarias, S., and Habte J, 2007. 'Survey on farmers' perceptions and management practices of insect pests on traditionally stored sorghum in southwestern Ethiopia''. Crop Protection. 26 (12): 1817- 1825

Chomchalow N, 2003. Protection of stored products with special reference to Thailand. A. U. J. T. 7(1):31-47. Jacobson

Compton, JAF., Tyler, PST., Hind marsh, PS., Golob, P., Boxall, RA, et al. 1993. Reducing losses in small farm grain storage in the tropics. Trop. Sci. 33:283–318.

Dekebe Moges, (2022). Efficacy of Indigenous Knowledge and Selected Modified Storage Structures to Insect Pests of Maize during Home Storage: A Review. Food Science and Nutrition Technology. ISSN: 2574-2701.

Derbalah, A. S. 2012. Efficacy of some botanical extracts against Trogoderma granarium in wheat grains with toxicity evaluation. The Scientific World Journal Doi:10.1100/2012/639854

Dubale, B., Sorri, W., Solomon A., Geremew B, 2012. Influence of Agro-ecolog, Traditional storage Continers ans Major Inect pest on stored Maize (Zea may. L)in selected woredas of Jima zone. Asian Journal of Plant Science. 11:226-234

Emana Getu and Assefa Gebre-Amlak, 1998. Arthropod pests of stored maize in Sidama Zone: economic importance and management practices. Pest Management Journal of Eth. 2(1&2): 26-35

Emana Getu, 1993: Studies on the distribution and control of Angoumois grain moth (Sitotroga cerealella) in Sidamo Administrative Region. M.Sc. Thesis, Alemaya University of Agriculture, Alemaya

Emana Getu, 1997: Chemical control of Angoumois grain moth, Sitotroga cerealella (Olivier). Paper presented at the Fourth Crop Protection Society of Ethiopia. 23-24 May 1996. Addis Abeba.

Gabriel, A.H. & Hundie, B, 2006. Farmers post-harvest grain management choices under liquidity constraints and impending risks: Implications for achieving food security objectives in Ethiopia. Proceedings of the international association of agricultural Economists Conference, August 12-18, Gold Cost, Australia John

Golob P, 1984. ''Improvements in maize storage for the small-holder farmer''. Tropical Stored Products Information, (50): 14-19.

Greenberg, S.M., Showler. A., Txiu 2005. Effects of neem-based insecticides on beet armyworm (Lepidoptera: Noctuidae). Insect schi.12(1). 17-32

Ignatowicz, S. and Wesolowska, B. 2015. Potential of common herbs as grain protectants: repellent effect of herb extracts on the granary weevil, Sitophilus granarius L. Proceedings of 6th International Working Conference on Stored-products Protection, 2: 790794.

Makanjuola WA, 1989. Evaluation of extracts of neem (Azadirachta indica A. Juss) for the control of some stored product pests. Journal of Stored Product Research. 25(4): 231-237.

Okonkwo, E. U. and Okoye, W. I. 1996. The efficacy of four seed powders and the essential oils as protectants of cowpea and maize grains against infestation by Callosobruchus maculatus (Fabricius) (Coleoptera:

Bruchidae) and Sitophilus zeamais (Motschulsky) (Coleoptera: Curculionidae) in Nigeria. International Journal of Pest Management, 42: 143-146.

Olaifa, J. I. and Erhun, W. O., 1988. Laboratory evaluation of Piper guineense for the protection of cowpea against Callosobruchus maculatus. Insect Science and its Application, 9, 55-59.

Osisiogu. I. W. U. and Agbakwuru, E. O. P., 1978. Insecticides of vegetable origin I. Dennettia oil, a new seed preservative. Nigerian Journal of Science, 12, 477-485

Phillip, W., Throne, J.E, 2010. Bio rational approaches to managing stored- products insects. Annual Review of Entomology. Annual Review. 55:375-397.

Sathyseelan, V., Baskaran, V. and Mohan, S. 2008. Efficacy of some indigenous pesticidal plants against pulse beetle *Callosobruchus chinensis* (L.) on green gram. Journal of Entomology, 5 (2): 128-132

Sorri W, (2014). Effect of seed botanicals and local seed storage practice on maize insect pests and maize seed in Jimma zone. Singapore Journal of scientific Research. 4(2): 19-28

SU, H. C. F., 1977. Insecticidal properties of black pepper to rice weevils and cowpea weevils. Journal of Economic Entomology, 70, 18-21

Togola, A., Seck PA., Glitho IA., Diagne A., Adda C., Ture A., Nwilene FE, (2013). Economic Losses from Insect Pests Infestation on rice Stored on farm in Benin. Journal of Applied Sciences.13, 278-285.

Wale, VD & Patil P.V, 2020. Indigenous Technical Knowledge for Weed Management and Insect-Pest Management. Agri Cos e-Newsletter. Volume: 01 Issue: 05 Article No: 27

Williams, J. O., 1983. Effect of treating maize with black pepper Piper nigrum (L.) on the maize weevil Sitophilus zeamais Motsch. Nigerian Stored Products Research Institute Technical Report No. 3, pp. 45- 48.