



## 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 plants 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 plants 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 plants 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.*

**Keywords:** botanical plants; local material; storage pests, management

### 1. 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 [1].

Among the key constraints to improving food security in Africa are losses resulting from poor post-harvest management of grains [2]. 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% [3]. 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 [4].

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 [5].

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 [6]. 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. [7] 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 [8]. 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.

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

Leaf extract of all the plants (*Prosopis* sp., *Nerium* sp., *Ocimum* sp., *Acalypha* sp., *Catharanthus* sp., and *Vitex* sp.) caused significant ovipositional deterrent effect against pulse beetle. Leaf extract of *Vitex* sp. leaf extract caused maximum reduction in egg viability (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%) [9]. Another study by [10] 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*

[11] other report indicated 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 [12].

Research result by (Sorri, 2014) study showed that three plant products (*Chenopodium*, *Nicotinia*, *Maesa lanceolata*) 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. lanceolata*). 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 [13].

[14] 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 [15]. 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 [16]. Different workers [17- 21] have confirmed that effectiveness of different botanical plants against storage pests.

[22] indicate that neem oil has a strong insecticidal effect on stored grain beetles when used in proportions ranging from 5 to 20 percent applied on packing bags. The least number of F1 adults emerged from black gram seeds treated with neem oil. The nishinda oil extract was the most toxic of three extracts tested (nishinda, eucalyptus and bankalmi). Bablah ash was the most effective compared to the powdered leaves of nishinda, eucalyptus and bankalmi. The powdered leaves and extracts of nishinda, eucalyptus and bankalmi, at a 3% mixture, provided good protection for black gram seeds by reducing insect oviposition, F1 adult emergence, and grain infestation rates. The oil treatment did not show adverse effects on germination capability of seeds, even after three months of treatment [23]

[24] 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 [25].

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 [26]. 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 [27].

## 3. 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

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