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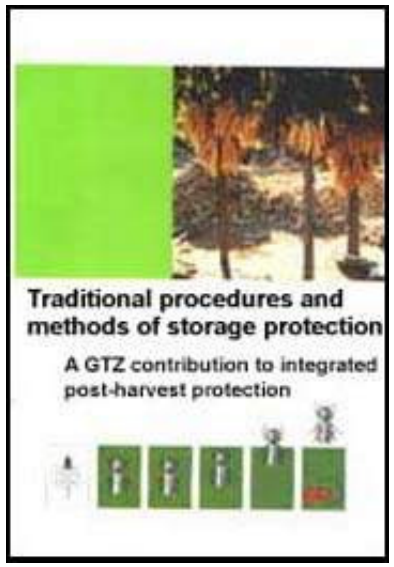

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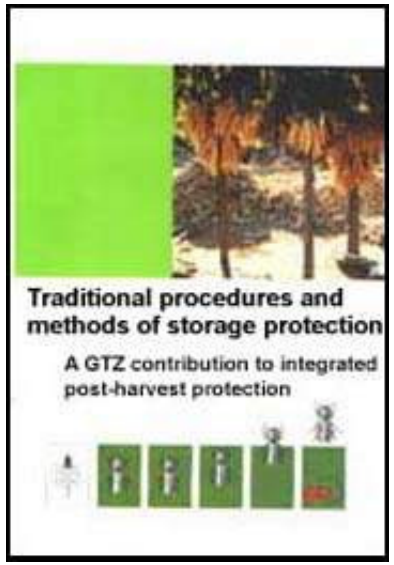

A GTZ contribution to integrated post-harvest protection

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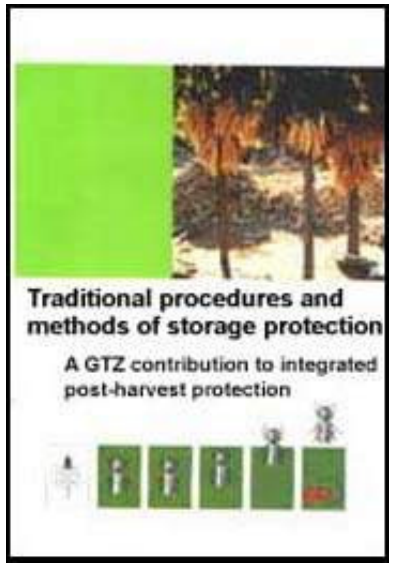

Preface

In the field of storage protection, peasant farmers are using chemical pesticides to an increasing extent. Surveys have shown that there are serious problems in the correct use of these chemicals, in the selection of appropriate products and in

their quality and availability. These factors cause major problems, and may entail very high risks.

The use of chemical pesticides has made a major contribution to the decrease in non-chemical treatments traditionally used by smallholders.

The information contained in the following publication addresses the problem within the context of both environmental protection and conservation of natural resources, whilst at the same time respecting the need to implement appropriate technologies

The traditional methods of storage protection presented in this brochure were compiled by the project "Post-Harvest Protection for Smallholders" (GTZ Section 423-2), and have already been published in French.

Observations have shown that traditional methods of protection are also practised by smallholders in English-speaking countries of Africa, yet in many places these methods have fallen into obscurity. For this reason, the project "Integrated Control of the Larger Grain Borer and Associated insect Pests in Farmers' Stores" has decided to have the brochure translated into English and published.

Since traditional methods of protection are often country-, region and/or situation-specific, it will often be necessary to adapt, modify or supplement them. This must be performed by national services, NGOs, or other organizations and individuals familiar with the respective local conditions.

This booklet aims to improve knowledge on non-chemical storage protection, to increase the potentials for applying these methods, and to promote corresponding

extension activities. The methods and techniques are presented here in order to help make extension staff aware of the alternative possibilities existing in their region with
regard to storage protection. It is hoped that this will stimulate an exchange of ideas between smallholders and extensionists concerning the nature of substances, and methods traditionally used to protect stored produce.

The listed substances are not registered products, but natural substances and preparations. Their mode of action varies. Consequently, it must be borne mind that differences in the active ingredient content of the substances mentioned (e.g. neem) or their formulation (e.g. ash), may entail differences in application and efficacy..

The effect of traditional stored-product protestants on the Larger Grain Borer *(Prostephanus truncates)* has been studied in only a few cases. Wherever information is available, it is presented in the columns on effects on target organisms (pests).

It must be remembered that the use of these plant compounds is not entirely free from certain risks, as only few studies have been done on their toxicity in humans.

Estimates of the efficiency of these traditional methods of storage protection vary. Therefore, implementation programmes might also focus on research and experimentation in order to answer these questions.

The target groups of this booklet are agricultural extension and plant protection staff, as well as the national research institutions engaged in post-harvest

protection. Non-governmental organisations, self-help groups and women's groups may also find it helpful.

The recommendations given in this booklet will be of particular interest to the African countries south of the Sahara.

The bibliographical sources used were too extensive to be included within the scope of the booklet.

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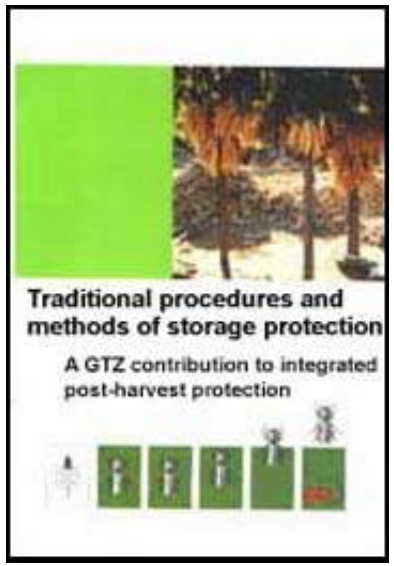

1 Sun drying

Product	Application	Mode of Action	Effects on Target

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
Action of the sun heat and light.	a) Spreading produce on the ground (court- yards or roadsides) to expose it to the sun.	The heat pests also inside the grains. The light expels pests the produce	All kills the kinds of pests, including larvae inside the grains.
	b) Utilising of simple solar dryers made of black iron sheets or plastics.	Drying reduces the risk of infestation by secondary pests and micro organisms	

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Very good, but without long term effectiveness.	Recommended and simple method. Effectiveness depends on a sufficient drying time. The lack of temperature regulation influences the germination capacity of seeds.	The whole African continent.

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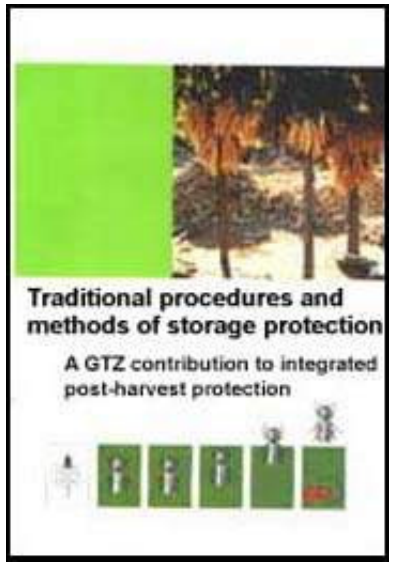
Traditional Procedures and Methods of Storage Protection (GTZ)



2 Drying above the fire-place and fumigation

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
Drying and storing above a fire-place.	a) Drying above fire-place on platforms. b) Storing the unthreshed produce above the fire- place	Drying immediate- ly after harvest above fire kills pests and eliminates the the risk of reinfestation. Smoke and soot repulse pests partly.	All kinds of pests. *Prostephanus truncates is* the only exception mentioned.

Effects on Target Organism	Remarks and particular Recommendation	Region	

Efficiency			
No integral protection. Not very, efficient at eliminating pests	Traditionally used in some countries, but this method has a doubtful effectiveness and only limited duration of efficiency. inside the grains!	Some countries of West and East	Africa.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
Fumigation using the smoke of green wood, leaves, or fruits of red pepper *(Capsicum)*	Fumigation of produce before storage (frequently used to store maize in husks)	Repulses pests.	All kinds of pests.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Good immediate efficiency. No valid data available concerning long term effectiveness.	Because fumigation alters the smell and taste of treated produce, this method is only recommended if these modifications are wanted or acceptable. Avoid direct contact with the fume because it irritates eyes and respiration	Some West African countries.

Product or	**Application**	**Mode of Action**	**Effects on**

Method			Target Organisms Pests
Drying of the produce with bush dryers.	The hot air of a wood fire is guided the	Rapid drying with relatively high temperatures, pests threshed produce. are repulsed or killed.	All kinds of pests.

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Good immediate efficiency larvae inside the grains. No long term effectiveness!	The killing of pests is a secondary effect of drying. Requires important fuel inputs! No regulation of temperature: possible consequences on germination capacity and composition of the grain.	Frequent where sufficient wood is available.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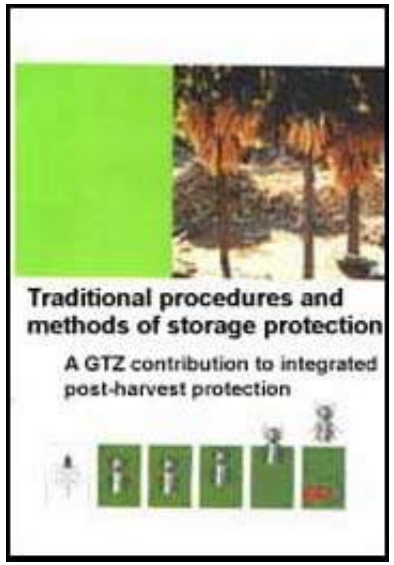

3 Airtight storage

Product or	Application	Mode of Action	Effects on Target
Method			Organisms Pests
Produce stored in airtight structures.	Storing in pits or containers, like barrels, hermetically sealed to reduce oxygen concentration and simultaneously increase the concentration of carbon dioxide (respiration of cereals).	Death of pests after some days due to a lack of oxygen and intoxication from carbon dioxide.	All kinds of pests, including mites and larvae inside the grains.

Effects on	Remarks and particular Recommendation	Region

Target Organism Efficiency		
Very good. The storage atmosphere becomes lethal after 2 - 3 weeks and the pests die. Ovicide effects.	Storage is possible only in very dry areas. Store only well dried produce! Containers stored above ground must be completely protected by shadow to avoid the condensation of water and mould growth. Avoid frequent opening of containers. Therefore, separate the produce for short term consumption from the produce for long term storage.	Arid and semi-arid regions of North-east Africa.

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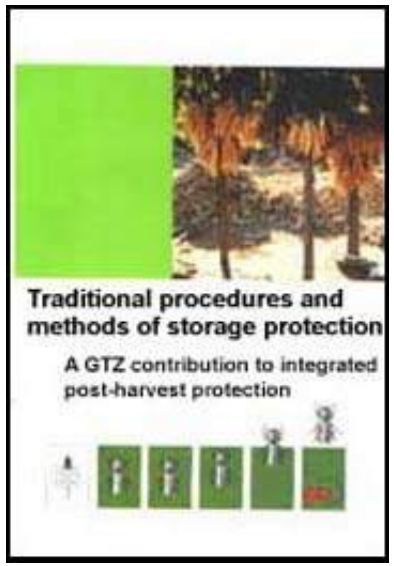


Traditional Procedures and Methods of Storage Protection (GTZ)

4 Substances of plant origin

4.1 Parts of green plants and powders

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
a) Fresh or dried leaves of *Annona reticulata* or other species of *Annona*	The leaves are mixed with the *produce* and, case of millet, used as a protective layer	These substances have repellent or in the (and larvicide) effects and discourage feeding. They also have in effects.	Broad field of eapplication: particularly in protection against bruchids in grain legumes and pests sorghum and millet storage. Also against *Corcyra cephalonica* (rice moth) and *Anthrenus spp.*

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Very good protection for 3 - 4 months	Because this is an effective storage protection method, one can recommend a wider utilisation after some experimentation	The whole African continent.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
b) Dried whole	The leaves are mixed with	The substances	Bruchids (*Bruchidae)* in

or powdered leaves of *Hyptis spicigera* (hard simsim, nino, an-doka, kindi).	the produce (3 g of powdered leaves / kg of produce). The leaves can also be placed between layers of produce (sandwich method).	have a direct insecticide effect; in bruchids greatly reduced oviposition and hatching of larvae.	grain legumes and peanuts *(Caryedon serratus).* Other applications: pests in stored cereals. Also used against termites in stored millet.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Good protection No indication concerning long term effectiveness	Appropriate for storage of grain legumes for 3 - 4 months. The concentration of active ingredients varies drastically depending on the provenance, the dosage used should differ correspondingly.	West Africa

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
c) Ground plants of *Lantana camara* and other *Lantana* spp.	Plants are mixed with the produce or *put* between the produce as protective layers(sandwich method)	Repellent.	Bruchids on grain legumes. Potato tuber moth(*Phthorimaea operculella)* in East Africa

Effects on Target Organism	**Remarks and particular Recommendation**	**Region**

Efficiency		
Length of protection can reach 6 months.	The frequency of this weed makes it easy to find. Wider utilisation can be recommended after some experimentation.	Nigeria and Central Africa.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
d) Dried leaves of neem *(Azadirachta indica* or other species of *(Melia);* whole or powdered.	Sandwich method mixed with the loose produce of maize or rice, also -used as a *protective* layer to reduce the risk of reinfestation.	The active ingredients of the plant have a direct insecticide and repulsive effect which inhibits feeding activities and influence development Fungicide effects are also known.	Some pests of stored cereals and grain legumes; generally coleoptera.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
The result is inferior to that of neem (see 4.5). Effectiveness can last up to one year depending on the applied dosage.	The concentration of active ingredient varies greatly according to the provenance. Adding the leaves to the stored produce is the simplest way to use neem for protection. However, powder or the oil of neem seeds are preferable.	Originates from India, today used on the African continent.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
e) Dried whole or powdered leaves of *Ocimum cannon* (hoary basil).	Mixed with the stored produce according to the sandwich method.	The ingredient linalool has a direct insecticide and larvicide effect.	Pests of stored grain legumes and cereals, particularly against *Zabrotes subfasciatus, Acanthoscelides obtectus Rhyzopertha dominica* and *Sitophilus oryzae.*

Effects on Target Organism	Remarks and particular	Region
Efficiency	**Recommendation**	
High initial efficiency: (mortality can reach 100 % in 24 hours); duration of effect insufficient for long term storage; but there is no exact indication concerning the long term effectiveness.	Known in Nigeria as a traditional method of protecting certain stored produce. Recommendable with reservations because of the short duration of effectiveness.	Nigeria.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
f) Leaves of mint *(Mentha spicata)* whole or powdered.	Mixed with the produce *(cereals)* at 0,5 to 2 per cent of the weight of cereal.	Due to the rapid death of pests during tests, one can assume insecticide effects.	Cereal pests; verified efficiency against *Sitophilus oryzae* (rice weevil).

Effects on Target Organism Efficiency	Remarks and particular	Region

	Recommendation	
Very efficient. During testing the average mortality of *5 oryzae* reached 100 % after 24 to 96 hours		West Africa.

4.2 Powders from lignified plant parts

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
a) Ponder of the bark of African Mahogany*(Khaya se-negalensis).*	The dried and powdered bark is mixed with the produce (50 to*100* g per kg).	Unknowns, thought to have insecticide effects.	Bruchids on grain legumes(particularly against *Bruchus maculates* on *Vigna unguiculata).*

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Medium to good protection for up to3 months storage.		Central Africa.

Product or	**Application**	**Mode of Action**	**Effects on Target**
Method			**Organisms Pests**
b) Dried rhizomes of*(Acorus calamus),*	The powder is mixed with the *produce* at	Certain ingredients of the essential oils have an insecticidal effect, inhibit development	Bruchids on grain legumes, pests of cereals (coleoptera and moths like *Sito philus oryzae, Tro goderma grana rium, Corcyra cephalonica)*

preferable as a powder, but also whole or as pieces.	0,1 to *%0* of the produce weight.	and feeding activities, repulse and sterilise pests	primarily on rice and wheat. Not as effective against *Tribolium* spp.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Very good results. Long term effect greater than 6 months.	*Acorus* has long been known as a medical plant. Long term contact with high Concentrations could be dangerous to humans. The powder can be stored up to 2 months without loss of efficacy.	In all regions of Africa where *Acorus* is found.

4.3 Powders from flowers, fruits or grains

Product or	**Application**	**Mode of Action**	**Effects on Target**
Method			**Organisms Pests**
a) Powdered flowers of *Chrysanthe- mum cinera- riaefolium* (pyrethrum).	Storage areas and produce are powdered.	The ingredients (pyrethrins) have insecticidal effects *(neurotoxic),* repulse and inhibit feeding activities.	All kinds of pests. Comparatively good effect on *Prostephanus truncates.*

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
High initial efficacy, but very limited long term effectiveness.	The active ingredient degrades rapidly because of sensitivity to light Useful where its knock down effect is desired. Take care during application; inhalation causes head aches, avoid all skin contact.	Countries of East Africa.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
b) Powder from dried fruits of red pepper *(Capsicum* spp.) whole fruits or pieces of the fruit (fresh or dried).	The powder is mixed with the produce at different dosages; used as a protective layer. Dried pods are burned underneath granaries (fumigation).	The ingredients are efficient as a feeding insecticide, inhibit feeding activities, are a repellent and can be used to fumigate; bactericide effects evident.	Against rice and other cereal pests; also frequently used against bruchids on grain legumes.

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Good	Traditional method of the Aztecs against maize pests, today well	Entire

protection for some months.	knownthroughout the world. Efficiency is strengthened by mixing with ashes and inert dusts. Take care when handling the powder; it causes irritation *mucous* membranes! It influences the taste and smell of the produce	African continent, especially West Africa.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
c) Dried fruit of black pepper *(Piper* spp) whole or powdered.	The dried preparations are mixed with the	The ingredients of the pepper act as a contact and feeding insecticide, inhibit feeding activity, and have a significant bactericidal effect	Coleoptera and moths in stored produce.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Good results for 3 months.	For protection of stored grain, legumes and rice against pests. Possible effect on taste and smell of the produce.	African countries with hot and humid climates.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms**

			Pests
d) Powder from ripe, dried kernels of neem.	Between 0,5 to4 volume °/0 on and grain legumes. contained in all	Efficiency is the same as for leaves (4. 1.d). The active ingredients are coleoptera. parts of the plant, the highest concentration is in the kernels.	Pests of stored cereals and grain legumes; particularly

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Good protection. Long term effectiveness can reach one year depending on dosage.	Differences in efficiency depending on the provenance of neem kernels must be considered for dosage. The germination capacity of seeds is not affected by the treatment.	Widely used on the entire African continent.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
f) Powdered grains of *Annona* spp.	0,5 to 2 grams on I 100g of grain legumes.	Efficiency is the same as 4.1 a.	Against coleoptera (particularly legumes) and moths (4 1 A)

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Good protection for 3 to 4 months.	Recommendable because of its efficiency. Avoid getting powder in eyes as this is painful	Entire African continent.

4.4 Water extracts of plants

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
a) Water extract of pyrethrum flowers.	Spraying of the liquid on the container of the stored produce.	Similar effect to the powder of the flowers (4.3a); insecticide, repellent and inhibitor of feeding activities.	All kinds of pests.

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
High initial efficiency but short duration of effect.	No long term efficiency, only appropriate as a treatment when an immediate effect is required (4.3a).	East African countries.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
b) Water extract of neem kernels (25 to 50 g/l water).	Between 0,5 to5 °/0 on cereals and legumes.	The efficiency is described in 4.1 d.	Pests of stored cereals and grain legumes; particularly coleoptera.

Effects on Target	Remarks and particular Recommendation	Region

Organism Efficiency		
Good protection. Long term efficacy can reach one year.	Water extracts of neem are more concentrated than the neem preparations already mentioned. The toxicity and secondary effects on humans beings and animals have not yet been sufficiently tested.	Widely used on the African continent.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
c) Water extract of *Crotolaria juncea* flowers.	Spraying of the liquid on the container of the stored produce.	Efficiency of a contact insecticide.	Cereal pests (*Sitophilus spp., Prostephanus truncates).*

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Protection inferior to those offered by extracts of neem, *Annona* or pepper. No valid experiences concerning long term efficiency.	Other species of *Crotolaria* are also used in traditional storage protection in Africa.	East Africa particularly in Tanzania

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
d) Water extract of red pepper fruit.	Spraying of the liquid on the container of the stored produce.	identical effects to the ones indicated in 4.3c.	Stored *product* coleoptera and moths.

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Very good efficiency for three months.	For grain legumes and rice. Change of taste and smell is possible. humid climates	Countries with hot and

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
e) Watery extract of *Annona* spp. roots.	2,5% water extract from the *roots.*	Effects are indicated in 4. 1.a.	Large field of application (4. la)

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Very good efficiency for more than three months.		Entire African continent.

4.5 Vegetable oils

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
a) Peanut oil.	5 ml/kg of grain legumes.	Toxic effect on the eggs of Bruchids. because of asphyxia due to lack of oxygen. Larvae living in side the grains are not affected. Ovi position is impeded	Bruchids in grain legumes.

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Protective effect can last up to 6 months.	Simple and cheap treatment of grain legumes. To ensure a successful treatment it is important to cover all surfaces of the grains equally. No negative effects on the taste because the oil does not become rancid during storage. No negative effect on germination capacity.	Entire *African* continent.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
b) Coconut oil.	5 to 10 ml/kg of grain legumes.	Similar effect to the one of peanut oil.	Bruchids in grain legumes.

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Protective effect lasts 3 to 6 months. Mortality of adult bruchids reaches60 %	See remarks concerning peanut oil.	West and Central Africa.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
c) Palm oil.	5 to 10 ml/kg of grain legumes. and legumes. coconut oil.	Similar effect to those of peanut	Bruchids m grain

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Protective effect lasts 3 to 6 months	See remarks concerning peanut oil. Be aware, intensive red color!	West and Central Africa.

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
d) Sesame oil. legumes.	5 ml/kg of grain	See peanut oil! legumes.	Bruchids in grain

Effects on Target Organism Efficiency	Remarks and particular Recommendation	Region
Protective effect lasts up to 6 months.	See remarks concerning peanut oil.	Entire African continent. .

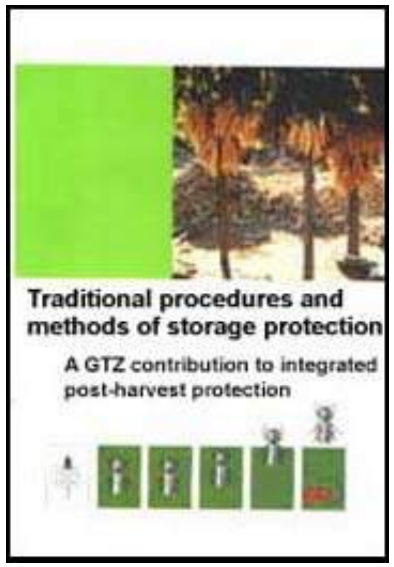
Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
e) Oil of ripe, dried neem kernels.	2 to 3 ml/kg for grain legumes and cereals. Follow local dosage experience.	One must add to the effects of the active ingredients mentioned in chapter 4.1 d the efficacy specific to the oil, similar to that of peanut oil.	Pests of stored cereals and grain legumes, particularly coleoptera.

Effects on Target	Remarks and particular Recommendation	Region

Organism Efficiency		
The average of efficiency is high (between 85 and100%). Long term effectiveness can attain one year depending on the dosage.	Neem oil has a bitter taste and becomes rancid during storage. One can reducethe negative effect on the taste by soa-king the produce in warm water for afew minutes. Nevertheless, for humanconsumption the use of peanut oil is pre ferable. Neem oil, which is free from fungus contamination, is basically non toxic. If fungus is present there is a risk of mycotoxins Neem oil is strongly recommended for seeds because	Widely used on the African continent

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
f) Shea Butter (Butyrosper- *mum parkii).* legumes.	5 ml of the melted butter per kg of cereals or grain	Comparable to the other vegetal oils mentioned. particularly coleoptera.	Pests of stored cereals and grain legumes,

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Long term effectiveness of about 4 months.	One can also use the residues from the production of shea butter.	Sahel.

5 Mineral substances

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
a) Wood ashes living(particularly recommended: *Khaya senegalensis, Eucalyptus* spp., *Afzelia africana, Ceiba*. *pentranda, Parkia*	Mixed with the stored produce: a) 3 parts of ash to 4 parts of produce *for* grain legumes. b) 1 to 1 or 1 to 2 in a volumetric ratio (ash /	Development inhibitor. Movement in the produce is strongly limited. Mortality of pests because of injured articulations(Zacher	Development stages of coleoptera on the grains, particularly bruchids and

Africans), household ashes, ashes of rice glumes and manure.	produce) for *O*ne can also treat walls of the storage container.	effect), desiccation and obturating of respiration apertures.	moths. No known effect against mites.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Mortality varies between 65 to 90°/O. Pests die between one to two weeks. Larvae inside the grains are not killed. Nevertheless, it will effect adults after hatching. Avoidance of penetration and oviposition on the surface of the produce.	There are differences between the types of *wood* ashes depending on their silicium content and their physical properties. One disadvantage is the high quantity of ashes which must be applied. Therefore, it should only be used for small amounts (seeds). Washing will partly clean the ashes from the produce, reduce decoloration and affected taste. Recommended for seeds because it does not effect germination capacity.	Entire African continent

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
b) Inert dusts: fine loamy minerals, laterite, dusts of loam, burnt lime [CaO] and quick lime	Dusts are mixed with the stored produce at a ratio of up to 50% Storage places are dusted and it is also used as a protective layer.	Mortality due to the same mechanical effects as described for ashes.	All development stages of pests living on the produce. Not known to be effective against mites.

Effects on Target	**Remarks and particular Recommendation**	**Region**

Organism Efficiency		
Good to very *good* depending on size and shape of the particles. Pests die within some days.	The quantity of application varies in function of the result (particle size). it is necessary to clean the product before consumption. inert dusts can also be used for techniques requiring an important technical equipment.	Arid and semi-arid areas. Efficiency reduced by humidity.

Product or Method	**Application**	**Mode of Action**	**Effects on Target Organisms Pests**
c) Fine sand	Sand mixed with the produce in a volumetric ratio up to 40°/0 (filling up all empty spaces between the grains) or used as a protective layer of2 to7cm thickness.	Prevents the movements of of insects which die of desiccation due to injuries.	Cereal pests and bruchids; development stages living on the grains.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
Satisfactory results can only be attained by combining the two methods: adding it to the produce and forming a protective layer. No efficiency against larva inside	Efficacy is generally limited to preventing the immigration of pests. Appropriate only for small amounts(e.g. storage in big jugs) because sand is a	All of Africa.

grains. It is only after hatching of adults that the following generation is inhibited.	very heavy substance Screening and cleaning the produce is necessary before consumption.	

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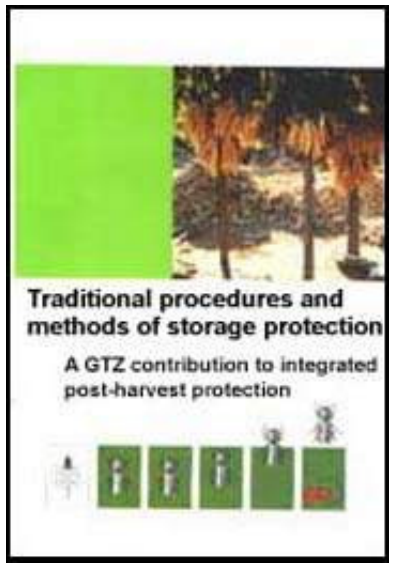

6 Substances of animal origin

Product or Method	Application	Mode of Action	Effects on Target Organisms Pests
Faeces and urine of	Treatment or washing of the storage places	Repellent.	Household

[illegible] goats and sheep diluted with water.	[illegible] and the surface of the stored and un-threshed produce(e.g maize stored	[illegible]	[illegible] animals and different storage pests.

Effects on Target Organism Efficiency	**Remarks and particular Recommendation**	**Region**
No valid data exist.	The efficiency of this method is really dubious Not without hygienic risks Not recommendable.	Certain countries of West Africa