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Proper Storage, disinfection and fumigation of good grains (Bag storage)

by

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The important factors that are responsible for the deterioration and damage of food grains are (i) insects, (ii) rats and (iii) moisture. The methods of proper storage and prevention of waste due to these causes are dealt with below.

Standard godowns for storage: The buildings (Godowns) should have high plinth, the floor should be above ground level to prevent dampness seeping in during rains. They should be located in places which are not subject to inundation during rains. The flooring should be 2½ to 3 feet thick of cement concrete with a damp proof course and brick masonry walls 18' high to permit stacking upto 15 bags. There should be good ventilation with adequate number of windows. The doors and windows must be close-fitting and should open outside. The ventilators should be just below the top of the walls so as to let in light. The ceiling should be terraced so that the

godown could be converted into a fumigatorium if the need arises otherwise may be roofed with Mangalore tiles or cement sheets. The corners of the walls should be rounded off and the walls and flooring should have smooth surface.

Rented or traders' godowns can be upgraded to the extent feasible by effecting improvements in providing pucca flooring, making the walls smooth, rounding off of the corners of walls and opening up ventilators etc.

Stacking of bags: Dunnage in the shape of bamboo poles or wooden sleepers, which are the best forms of dunnage, should be laid on the stack base, six inches apart and stacks built on the dunnage in a criss cross manner. The criss cross method will ensure stability of the stacks. Dunnage will raise the stacks off the floor, will prevent the bags absorbing the floor moisture, if any, and also provide ventilation to the bottom bags by free flow of air. In the absence of bamboo dunnage, matting can be used but the former should be insisted upon, as matting will harbour insects and would become worn out soon.

Stacks should not be built to more than 15 bags height limiting the capacity of the stack to 750 bags. Stack base should also be not more than 15 ft. by 15 ft. In the case of flour and milled products, the height of the stack must be limited to 10 bags. There should be a clearance of 3 feet between the ceiling and the top of the stacks to facilitate workers for disinfection and fumigation work and other operations. Each stack should not consist of more than one kind of grains.

Each stack shall be separated from the neighbouring stack and/or the wall by an alleyway of $1\frac{1}{2}$ to 2 feet. This will prevent cross infestation, afford ample ventilation and provide moving space round the stacks for inspection, disinfection and other operations.

Only well dried stocks should be brought for storage. Grains showing moisture will get heated up and will be susceptible to insect attack easily.

Examination for infestation: The stocks should be inspected once a month at least and insect infestation determined by drawing samples at random from each stack. Samples from about 5% of the bags should be drawn, pooled and examined to estimate the infestation, viz., number of insects per pound together with the percentage of tunnelled grains by count.

Categorisation of stocks: On the basis of infestation, the stocks may be categorised as follows.

(a) Sound grains and free from infestation - tentative period of storage 4 months.

(b) Grains showing 4% weevilling by count in the periphery bags - tentative period of storage 2 months.

(c) Grains showing 5-10% weevilling in the periphery bags should be fumigated unless issued for consumption within 2-3 weeks.

(d) Grains showing over 10% weeviling should not be released before they are fumigated and cleaned if necessary.

(e) Stocks heavily weevilled and/or mouldy must be declared unfit for human consumption in consultation with the health authorities.

Provision of stack card: Each stack shall be provided with a stack card which should contain.

- (1) The name of the stockist.
- (2) The name of the godown.
- (3) Kind of grain.
- (4) Date of receipt.
- (5) Source of supply.
- (6) Quantity in bags with average weight of each bag.
- (7) Issues, if any, with dates
- (8) Closing balance.
- (9) Remarks.

Disinfestation: To protect the stocks against infestation by insects, the stocks should be periodically dusted with either BHC or DDT. This will keep the stocks well if they are free from infestation at the time of storage or prevent cross infestation if any of the stack is infested. Each stack should be dusted on all the four faces of the stack and on the top surface. The floor area of the alleyway must also be dusted, the dose to be used being 8 ozs. per 100, sq. ft. In the case of BHC the dusting should be given once in 1½-2 months but in the case of DDT which has a longer period of insecticidal action, it will be sufficient if the dusting, is done once in 2 months. Before giving the next dusting, the bags should be properly brushed to remove the residues of the previous dustings, dead insects, etc.

Empty godowns previously used for storage of foodgrains should also be disinfested before bringing in new stocks for storage.

Flour or milled stocks may be protected in storage by dusting the bags with Pyrodust at 8 ozs. per 100 sq. ft.

Precautions to be observed during disinfestation: The operators should not remain too long in BHC or DDT atmosphere. They should get out into the open to breathe fresh air every half an hour of operation if they experience discomfort. The operators should cover their mouths and nostrils with a piece of cloth and wear long sleeved shirts and trousers to prevent inhaling the dust and to avoid dust settling on their body. Care should be taken to see that the parts of the person exposed to the insecticides are not greasy or oily to prevent absorption of the chemical and thorough washing of the exposed parts is essential after the dusting operation.

Fumigation: The stocks shall be fumigated if the infestation warrants the action. The fumigants commonly used in Madras State are (1) Ethylene dichloride - Carbon tetrachloride mixture (EDCT) sold under the trade names Chlorosol or Killoptera, and (2) Calcium cyanide (Cyanogas). The former is less risky, less poisonous and easier to use than the latter but in case EDCT is not easily procurable, Cyanogas will have to be used. The gas produced by EDCT is heavier than air and the liquid will have to be poured on the top surface of the stacks. Cyanogas (HCN) is lighter than air and the dust should be applied at the bottom of the stacks. There is no need to test the grains for chemical residues in the case of stocks fumigated with EDCT as it is non-poisonous but in the case of stocks fumigated with Calcium cyanide, samples of fumigated grain from different pockets of the godown will have to be tested for residual HCN. The fumigated stocks should be subjected to continued aeration till the residual HCN is brought down to permissible limit. Samples of grains put in hermetically sealed containers should be referred for analysis either to the Government Analyst, Guindy, or the Government Agricultural Chemist, Lawley Road, whoever is nearer to the fumigation centre.

EDCT Fumigation: If the godown is a terraced one and all the stocks stored in it require fumigation the building should be made airtight by closing all doors, ventilators and windows with mud plaster or paper leaving one doorway for entrance and insecticidal operation. Then the required quantity of fumigant at the rate of 20 lbs. per 1000 c. ft. should be measured out in buckets, lifted to the top of the stacks and emptied over the stacks uniformly with the least possible delay, the workers should come out immediately, close the entrance door and seal it airtight. After an exposure of 48 hours, the godown as well as the doors and windows should be kept open for a day for degassing and for free ingress of fresh air.

In the case of godowns that cannot be made airtight or where only a few stacks require treatment, fumigation can be done by covering the stacks with gas proof covers or gas proof sheets. The required quantity of the chemical at the rate of 40 lbs. per 1000 maunds of grains, should be applied through the tube openings provided at the top of the gas proof covers or by lifting the overlaps of the gas proof sheets at the top of the stack. After pouring the chemical, the tube openings should be folded and tied securely in the case of covers and the overlaps weighted with sand bags in the case of gas proof sheets; the flaps at the bottom of the stacks all round may be similarly weighted or pasted to the flooring with paper so as not to allow the gas to escape from the stacks. The fumigated stocks may be degassed after an exposure of 48 hours by lifting the gas proof covers and sheets partially for the gas to dissipate.

Cyanogas fumigation: Cyanogas is a deadly poison. Fumigation with this chemical should be done only by experienced personnel or under expert supervision. After making the godown airtight, the required quantity of dust at the rate of $3\frac{1}{2}$ lbs. per 1000 c. ft. should be pumped into the godown from outside by means of foot pumps through inlet holes. The gas should be so directed into the godown that it does not fall against the face of the stack but falls between stacks or stacks and walls, in the alleyways.

In the case of tiled godowns, the volume of space to be fumigated may be reduced by providing a canopy of tarpaulins over the stacks. Tarpaulins should be spread over stack tops from wall to wall and the tarpaulin ends touching the walls put in position against the walls by placing bamboo props against the walls and stack sides in the alleyway. The canopy thus provided will also prevent leakage of gas through roofing.

After an exposure of 48 to 72 hours, the godown should be opened and all doors and windows kept open for aeration and degassing for 2-3 days.

Samples of fumigated grains should be drawn and sent to the Government Analyst or the Government Agricultural Chemist as the case may be, for analysis of residual HCN. When the godown is fit for entry of workers, the stacks and flooring should be swept for removing the residual dust. Grain samples must be examined for infestation, both before and after fumigation to test the efficacy of the treatment.

Precautions: The Cyanogas dust should not be inhaled or touched by hand. The workers should wash their hands and face after operation. Cyanogas must be stored in a dry place and the containers kept airtight.

Control of Rats: Damage to foodgrains by rats is considerable and destruction of rats by poison baiting must be attended to systematically. Zinc phosphide is an effective rat poison and can be used at 5% by weight on all baits like atta, gram flour, boiled rice, puffed rice, bread, etc.

To prevent rats gnawing the wood and gaining entry into the godown, the bottom four inches of doors should be fitted with tin plates on both inside and outside - one sheet passing under the door should be used for both sides and should overlap the open edge of the door.

Preventing entry of Birds, Squirrels and Monkeys into Godowns: Sometimes damage to grains by sparrows, especially if the grain stores is paddy, is appreciable, besides being a great nuisance. In order to prevent the entry of birds, squirrels and monkeys into godowns all ventilators and windows may be fitted with close-meshed wire netting.

Maintenance of godown hygiene: Godowns should be kept open during daytime on all non-rainy days, including the windows and doors. The aeration thus provided will keep the grains well in storage. Any excess of moisture in grains will also be removed.

The floor space of the godown should be swept once a week and the portions so swept, lightly dusted with BHC or DDT.

Spilled grains should be collected every week during sweeping, cleaned and stored separately. Cleaning should not be done in the main storage godown.

Old used gunnies and dunnage (matting) should not be held in the main storage godown as they are apt to harbour insects.

Sweepings must never be allowed to be pushed into corners or hidden under stacks or dunnage (mats).

Reconditioning of infested materials should never be done in the main storage godown or in its vicinity. It is better done in an isolation shed.

The residues obtained in reconditioning must be buried or burnt.

For any further details, enquiries may be made of the Entomologist and Associate professor of Entomology, Agricultural College and Research Institute, Coimbatore-3.