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The Storage of *Cholam* or *Jonna* Grain (*Sorghum vulgare*, Pers.) Free From Insect Attack.

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The storage of sorghum, without the grain being damaged by insects during storage, has been a problem with the cultivators, merchants and organisations dealing with sorghum either for food or for sowing purposes. Sometimes large quantities of grain are imported from other provinces and in a short time the grains get badly damaged by insects and the stock becomes unfit for consumption. At the Agricultural Research Station, Hagari, (Bellary District—Madras Presidency) the need for storing about 10,000 lbs. of *jonna* grain (for seed purposes) for about 10 months, i. e. from May 1944, the time of commencement of storing the harvested grain, to February 1945, the time of harvesting the next crop, was keenly felt, in the absence of naphthaleine or sulphur which are the usual preservatives at the station. Acorus powder was used to protect these grains and it was found to be very effective. The object of this short note is to bring to the notice of the public, cultivators, merchants and others interested in this problem, the results of a large scale experiment conducted at this station, on the storage of *jonna* grain with Acorus powder As new grain from the field is now coming on, the experiment has served its purpose.

2. The Government Entomologist was consulted with regard to the use of Acorus. He kindly arranged to supply 100 lbs. of rhizomes of Acorus and he also offered to help in the identification of the insects. The roots were cleaned and powdered by pounding. The dose recommended was 2 lbs. of powder to be well mixed with 100 lbs. of jonna grain.

3 The following are the details of this large scale experiment. There were two treatments and one control. (1) A large (condemned) iron tank (not air tight or water tight) which was the container commonly in use at this station was filled with 4,000 lbs of *cholam* which was well mixed with 80 lbs of Acorus powder. This grain occupied $\frac{3}{4}$ the volume of the tank. There is an iron lid to the tank. (2) An iron ordinary seed drum was filled to about $\frac{1}{4}$ its capacity by 100 lbs of *cholam* grain well mixed with 2 lbs. of Acorus powder and was closed with a lid; and (3) an exactly similar seed drum in which was poured 100 lbs. of *cholam* seed without any treatment, as control and closed with its lid. These drums are also not air tight. All these three containers were kept together in one place in the seed store. The grain used was of the strain M. 47-3 which was harvested in March 1944 and dried. The storage experiment commenced on 7-8-'44. As suggested by the Government Entomologist every month random

samples of 1 lb. were drawn from each of these containers and the number of live and dead insects were counted, for the estimation of the insect population and the extent of damage was estimated by counting the number of damaged grains in 4 sub samples of 400 grains each. The results obtained are given below:—

Large scale storage experiment on *Jonna (cholam)* with Acorus powder.
(Started on 7—8—1944.)

			Dates of observations.						
			29-8-44	29-9-44	29-10-44	29-11-44	29-12-44	29-1-45	28-2-45
(1)	Big iron tank with 4,000 lbs. of grain mixed with 80 lbs. of Acorus powder.	No. of insects in a lb. sample: Live	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil
		Dead	Nil.	1	Nil.	Nil.	1	2	1
		No. of damaged grains in a sample of 1600 grains	Nil.	3	2	1	1	3	2
		Percentage of damage	Nil.	0·19	0·13	0·06	0·06	0·19	0·13
(2)	Iron seed bin with 100 lbs. of grain mixed with 2 lbs. of Acorus powder.	No. of insects in a lb. sample: Live	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil
		Dead	2	Nil.	3	2	Nil.	Nil.	Nil.
		No of damaged grains in a sample of 1600 grains	Nil.	2	1	3	2	Nil.	5
		Percentage of damage	Nil.	0·13	0·06	0·19	0·13	Nil.	0·31
(3)	Iron seed bin with 100 lbs. of grain not treated, as control.	No. of insects in a lb. sample: Live	20	10	24	13	54	61	54
		Dead	5	3	3	3	8	18	8
		No of damaged grains in a sample of 1600 grains	24	61	69	150	162	190	284
		Percentage of damage	1·5	3 81	4·31	9·38	10·12	11·88	17·75

4. From the above table it will be seen that within eight months, in the untreated control bin (3) there is a progressive increase in the number of insects. This cannot be taken as being very accurate as a number of live moths fly away each time the lid is opened. The extent of damage is however more correctly estimated. The damage has progressively increased to 17·75% within eight months. The grain has clotted and webbed with broken grains and flour. The stuff is practically unfit either for sowing or for human consumption. It means that out of every 100 bags, 17 bags are now mere dust. The loss is increasing rapidly. When the data for the two treatments (1 and 2) are examined the difference is striking and very clear. The damage to grains is practically nil and the grain appears to be quite new, both in the small seed bin as well as in the large tank. Acorus powder has effectively prevented insect damage to stored *jonna* grains.

5. The seed preserved with Acorus powder was tested for germination capacity and compared with seed of M. 47—3 not treated but well preserved by good and constant drying and cleaning, in another part of the storeroom. The germination percentages in both were good and equal being

50%. The seed preserved with Acorus powder was tested and eaten to see if any smell sticks to the grain. There was no smell either agreeable or disagreeable in the treated grain when well cleaned and dried. Acorus powder at 2 lbs. for every 100 lbs. of grain is recommended for extensive use in protecting stored *jonna* against insect pests.

6. *Acorus calamus*, L. is commonly called the "Sweet flag" or "Vasambu" in *Tamil* or "Vasa" in *Telugu*. It is a root crop cultivated in several districts of Southern India. It is very commonly known as a medicine for cold and cough. Its insecticidal properties are not so well known. The widespread use of these roots for this purpose will stimulate a wider cultivation of the same benefitting both the grower and the user.

7. The insects that were damaging the stored *jonna* grain were mostly the whitish caterpillars of moths (*Corcyra*). The next in the order of importance was the dark weevil (*Calandra*). The red beetle (*Tribolium*) was also found but was not so numerous.

8. The help and co-operation of the Government Entomologist in this experiment of preserving *jonna* grains in storage at this station by Acorus powder, are herewith acknowledged.

Summary. At the Agricultural Research Station, Hagari (Bellary Dist. —Madras Presidency) there is a need to protect the grains of sorghum (*Sorghum vulgare*) *cholam* or *jonna*, for about 8 months in the year, i. e. from the time of the harvest of the crop to the sowing time, against insect pests which badly damage the grains in storage. In a large scale experiment involving the use of 4,000 lbs. of grain it was observed that the powdered roots of *Acorus calamus*, L. have effectively prevented damage from insects. The insect pests met with are *Corcyra* moths, *Calandra* weevils and *Tribolium* beetles. *Acorus calamus* is a root crop cultivated in Southern India.

SELECTED ARTICLE

Soils of India.*

By D. N WADIA

Introduction. Soil is the topmost layer of the earth's outer crust capping the rocks exposed at the surface. It is a natural body of variable thickness, composed of disintegrated rock material together with variable proportions of organic matter mostly unconsolidated, generally differentiated into zones or layers, the lowest of which passes imperceptibly into the parent rocks below.

Soils of all countries constitute the most valuable part of their ground surface and generally their greatest natural asset. Broadly speaking, soils are the subaerially altered residues of the mechanical and chemcial weathering of the surface rocks, proceeding slowly under the influence of climate, vegetation and relief of the land and mingled with varying proportion of decomposed organic matter (humus). A subordinate type of soils of less value in zonal soil types, but of vital importance in India because of its wide areal distribution is the alluvial or drift soil, where the soil cap is formed of deposits of alluvial detritus

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