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Optimum Safe Drying Temperature for Seed Grains

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Abstract: Samples of selected fresh grains (Beans, Rice, Corn, Groundnuts) were dried in a grain dryer at different temperatures (313, 318, 328, 333 and 338) k. The dried batches of each sample were stored and used for the experiment. The experimental grains were planted during the planning season. The germination capacity, field sprouting capacity and yield of the grains were evaluated in order to determine the best regime for the seed grains. The results obtained proved the fallacy inherent in the opinion that drying (using heat) causes deterioration of send qualities. Results from the field sprouting capacity of the test seeds confirmed that on sowing grains which are subjected drying under improved regimes, a uniformity of shoots and general development of plants were obtained. Their yields increased considerably when compared with seeds purchased from the market which were dried by sum drying techniques. Based on the results obtained from this research the maximum dying temperature range for seed grains is between 313-323K.

Key words: Dehydration, temperature, germination, sprouting, yield

INTRODUCTION

Drying is a solid-liquid separation process aimed at reducing the moisture content of a solid. Drying is one of man's oldest methods of food preservation. All grains can be preserved by sun drying. However, there have been periods in history when climatic factors were such that grains failed to dry properly in the filed (Enescu, 1990). In these instance man attempted to assist natural action by supplying heat to the grains which otherwise would decompose. The use of heat from firewood and electricity to dry food is known as artificial drying or dehydration. This implies control over climatic conditions within a chamber thereby creating suitable microenvironment (Hannahy and Docratis, 1998). During drying, heat and mass transfer occur simultaneously (Mathur and Gishler, 1974).

Good sanitary conditions are always maintained in dehydration process as against the open filed drying where contamination from dust. Birds, wind, ants and decay are encountered by farmers. Dehydration is however a more expensive process than sun drying but the dried foods may attract higher monetary value due to improved quality as against their sun dried counterparts. Cereals, legumes, nuts and certain fruits are better reserved by drying rather than by any other method of food preservation (Lonnauro *et al*., 1985).

One of the major problems facing the farmers is low productivity due to poor quality of seeds. Dehydration of seed grains with very high temperatures will result in damage to the seeds (Bell, 1983). This will result in poor sprouting and vitality vigor of the seeds. Hence this research is aimed at determining the optimum drying temperatures for seed grains with a view to increasing productivity of grains through the use of high quality seed grains.

MATERIALS AND METHODS

Four different grains, viz, beans, rice, corn and groundnut were used in this work. The fresh rice and beans samples were collected from Ulonna Farm Settlement in Afugiri, Umuahia North Local Government Area, Abia State. The fresh groundnut samples were collected from Michael Okpara College of Agriculture Umuagwo, Imo State, while the fresh corn was bought from markers in Umuahia. Drying these grain, the grains were dried in a Triple Deck grain dryer using air as the drying medium.

Drying of samples: Twenty kilograms of each grain sample were dried to a constant moisture content at different temperatures in a pilot grain dryer. The following drying temperatures were used: (313, 318, 323, 328, 333 and 338) in Table 1.

Determination of the performance of the seed grains at the optical temperature: The experiment was conduct on a piece of land mapped out in Amakohia-Ubi in Owerri

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West Local Government Area, Imo State. The trial was on a acidic sandy loam soil with pH of 4.9. The land was cleared and formed into ridges. The 500 g of test samples dried at 328 k and the purchased seeds from the market were planted. The following intervals of planting were used on the 100 cm wide ridges at 50 cm intervals:

- Corn at 4 seeds/hole.
- Beans at 2 seeds/hole.
- Rice at 4 seeds/hole.
- Groundnut 4 seeds/hole.

Planting was done during the rainy season in rainy season in the month of April. Both the experimental grains and the grains purchased from the market were planted by 20 farmers.

Manual weeding was carried out at intervals. Compound dertilizer (NPK. 15:15:16) was applied to all plots in shallow grooves made on both sides of the ridges 4 weeks after planning. Vector 85 insecticide was used to control pests.

The germination period of the seedlings were measured in days to determine which regime favoured the germination capacity most (Table 2).

The vitality and seeding vigor of the grains were also evaluated and scored on an arbitrary scale of 1-10 in ascending order of desirability by the farmers. The yields obtained were also measured in kilograms and the results recorded in Table 2.

Table 1: Effect of drying temperature on grains

	Moisture content (%)				
Grain	Initial	Final	Quantity of grain (kg)	Drying temperature	Drying time minute
Corn	30	14	42	313	98
	30	14	42	318	90
	30	14	42	323	74
	30	14	42	328	48
	30	14	42	333	34
	30	14	42	338	30
Beans	27	12	36	313	80
	27	12	36	318	65
	27	12	36	323	57
	27	12	36	328	41
	27	12	36	333	20
	27	12	36	338	10
Rice	29	17	61	313	100
	29	17	61	318	85
	29	17	61	323	75
	29	17	61	328	55
	29	17	61	333	40
	29	17	61	338	35
Groundnut	32	10	32	313	60
	32	10	32	318	51
	32	10	32	323	43
	32	10	32	328	30
	32	10	32	333	25
	32	10	32	338	10

Table 2: Effect of drying temperature on the seed qualities

Grain	Moisture content (%)	Drying temperature	Germination/ sprouting times (days)	Vitality	Seedling Vigor
Corn	14	313	4	10	10
	14	318	4-5	9	10
	14	323	5	8	9
	14	328	6	6	7
	14	333	6-7	Less than 4.0	
	14	338	Did'nt sprout	No result	0
Beans	12	313	3-4	10	10
	12	318	4	10	9
	12	323	5	8	8
	12	328	5-6	7	6
	12	333	7-8	3	3
	12	338	Did'nt sprout	Nothing	0
Rice	17	313	5	10	10
	17	318	5-6	8	7
	17	323	7	5	4
	17	328	Did'nt spout	No result	0
	17	333	" " "	" " "	0
	17	338	" " "	" " "	0
Groundnut	10	313	4	10	10
	10	318	4	8	10
	10	323	4-5	5	8
	10	328	5	No result	3
	10	333	Did'nt spout	" " "	0
	10	338	" " "	" " "	0

RESULTS AND DISCUSSION

Table 1 presents the results obtained from drying of the experimental grains. It can be observed from the table that drying time decreases as the temperature increases. However, drying of grains destined for planting should be conducted with due regard to the preservation of the seed quality.

Table 2 shows that low heat regimes favours the germination capacity and the sprouting energy of the grains. The results suggest that drying of seed grain at an optimum temperature of 328 K does not harm the seed grains and even leads to an appreciable increase in the germinating capacity and sprouting energy. They yield is also high for seed grains dried with low heat regimes. The amount of product m harvested decreased with an increase in the drying temperature (Table 2).

Table 3: Comparison between the sprouting qualified and yields of the experiemental grands and the grands bought from the market

Grain	Moisture contents (%)	Dried temp. (K)	Sprouting time (days)	Vitality	Yield kg
Corn test	14	318	4	10	50
Corn bought from the market	13	Sun	6	7	23
Beans test	12	323	3-4	10	25
Beans bought from the market	10	Sun	5 -6	8	17
Rice test	17	318	7	10	35
Rice bought from the market	14	Sun	7	8	16
Groundnut test	10	323	4	10	53
Groundnut bought from the market	10	Sun	5	8	25

When compared with the seed grains purchased from the local market, the test seed exhibited higher yields than the purchased seeds (Table 3).

CONCLUSION

The optimum drying temperature for selected seed grains have been established. On the basis of this research, the following drying temperature ranges for the seed grains investigated are recommended.

Corn - 313-328K
Beans - 313-322K
Rice - 313-318K
Groundnut - 313-328K

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