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EFFECT OF FUMIGATION ON THE GERMINATION OF WHEAT

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The fumigation effect of the recommended dose, each of EDCT, Dlowfume, Detia and Phostoxin on the germination of SA–75, Sandal, Chenab 70 and LU 26 during exposure periods of 3–14 days was insignificant. However, higher doses of EDCT and Dowfume proved more damaging than Detia and Phostoxin and this effect was greater at longer exposure periods of 14 and 21 days. Further, the germination of treated LU 26 with the highest dose at the longest exposure period was affected the most (26.00%) and that of SA 75 and Sandal the least (16.66%).

INTRODUCTION

It is well known that during the storage period wheat is attacked by different insect pests viz. *Trogoderma granarium, Sitophilus oryzae, Tribollum* spp. *Sitotroga cerealella*, etc. and consequently both quantity and quality are adversely affected and it is estimated that on an average 10–15% wheat is lost on this account. To overcome the problem of insect pests under storage, various measures are recommended by the experts. One of the important measures is to fumigate the stored wheat so as to keep it free from the ravages of insect pests. However, it has been reported that the germination capacity of the wheat treated with fumigants is adversely affected. (Strong and Lindgren, 1960; Blackith and Lubatti, 1965; Haq and Ulfat, 1966; Gostick, 1970 and Kamel *et al.*, 1970a, b and 1975).

The present studies were undertaken to ascertain the effect of Detia, Phostoxin, EDCT and Dowfume on the germination of SA 75, Sandal, Chenab 70 and LU 26 when exposed to different doses of these fumigants for the exposure periods ranging between 3–21 days.

MATERIALS AND METHODS

The moisture contents of SA 75 (11.85%), Sandal (11.55%), Chenab 70 (12.15%) and LU 26 (12.25%) were determined with the help of an Automatic

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Electric Moisture Content Tester at 90°F, taking 250 gm samples of each variety. Four doses of four fumigants used per 1000 c.ft. to treat four different wheat varieties for four exposure periods of 3, 7, 14 and 21 days were as follows:

Fumigants	*Doses (Lbs) per 1000 c. ft.*			
	D_1	D_2	D_3	D_4
Detia (F_1)	0.13	0.26	0.39	0.52
Phostoxin (F_2)	0.13	0.26	0.39	0.52
EDCT (F_3)	10.00	20.00	30.00	40.00
Dowfume (F_4)	10.00	20.00	30.00	40.00

Four samples weighing 6 gm each, representing all the four varieties, taken in four different cloth bags were placed in an earthenware glazed jar measuring 0.24 c.ft. The lowest dose (D_1) of Detia calculated per 0.24 c.ft. was added to this jar, which was made airtight by immediately placing a piece of cellophane sheet under the lid and soon thereafter by mud plastering the lid. Similar procedure was followed in the rest of the doses (D_2, D_3, D_4). There were three replications and thus in all there were 196 earthenware glass jars including 4 under check (D_0).

On the expiry of the respective exposure periods of 3, 7, 14 and 21 days, the samples were taken out of the jars and 100 seeds selected at random from each sample were used to test the germination capacity of different wheat varieties. The selected seeds were scattered in the petri dishes of 4" diameter having moist filter paper at the base. These seeds were covered by another filter paper. Seeds were kept moist during the germination test by applying water twice a day, in the morning and in the afternoon. The seeds that germinated after 72 hours were counted, and the germination data analysed statistically.

RESULTS AND DISCUSSIONS

The studies conducted to find out the effect of fumigation on wheat seed germination revealed that Dowfume affected the germination of treated wheat maximum and it was followed in descending order by EDCT, Phostoxin and Detia. Further, higher the dose the greater was the damage and the same was true at longer exposure periods of 14 and 21 days (Table 1).

The results based on the interaction of different factors studied (Table 2) showed that the recommended dose (D_1) of each of EDCT, Dowfume, Detia and Phostoxin did not affect the seed germination of different wheat varieties

Table 1. *Effect of fumigants, doses and exposure periods on the germinaten of different wheat varieties*

Fumigants	% germination	Doses	% germination	Exposure periods (days)	% germination
Delia (F_1)	92.33[a]	D_1	95.32[a]	3 (I_1)	92.42[a]
Phostoxin (F_2)	92.05[b]	D_2	94.44[b]	7 (I_2)	92.30[a]
EDCT (F_3)	91.09[c]	D_3	88.65[c]	14 (I_3)	91.50[b]
Dowfume (F_4)	90.72[d]	D_4	83.37[d]	21 (I_4)	89.98[c]

Table 2. *Comparative effect of various doses of fumigants on per cent germination of wheat varieties at different exposure periods.*

		IVFD Interaction				
		D_0	D_1	D_2	D_3	D_4
I_1V_1						
	F_1	96.66	96.66	96.00	93.00	90.33
	F_2	96.66	95.67	95.00	92.00	90.00
	F_3	97.00	96.67	95.67	92.00	85.67
	F_4	96.33	96.33	96.00	92.00	87.67
I_1V_2						
	F_1	96.33	95.33	94.33	92.67	90.00
	F_2	96.00	95.67	95.00	92.00	90.00
	F_3	96.00	96.00	95.00	91.00	88.00
	F_4	95.66	95.00	94.00	92.33	87.00
I_1V_3						
	F_1	95.66	94.67	93.67	90.00	84.67
	F_2	95.33	94.00	93.00	89.00	86.00
	F_3	95.33	95.00	93.33	88.67	83.33
	F_4	95.66	95.00	94.33	90.00	82.33
I_1V_4						
	F_1	96.33	96.00	95.00	90.00	83.33
	F_2	96.00	95.67	95.00	90.67	83.00
	F_3	96.00	96.00	94.00	85.67	81.67
	F_4	96.00	95.00	94.67	84.33	76.33
I_2V_1						
	F_1	96.66	96.33	95.67	91.67	90.33
	F_2	97.00	96.33	94.67	92.67	90.33
	F_3	96.66	96.33	96.00	92.33	87.33
	F_4	96.66	96.66	96.33	92.67	84.33
I_2V_2						
	F_1	96.00	95.00	95.00	93.67	90.67
	F_2	97.00	96.33	94.67	92.67	90.33
	F_3	96.33	96.00	95.33	91.00	87.00
	F_4	96.33	96.00	95.33	92.00	85.00

I_2V_3	F_1	95.33	94.67	94.33	90.00	85.00
	F_2	95.33	94.67	94.33	90.00	85.00
	F_3	95.66	95.00	94.00	88.00	81.67
	F_4	95.66	95.33	94.00	89.33	82.67
I_2V_4	F_1	96.00	95.33	94.67	88.00	82.00
	F_2	96.00	95.67	94.00	90.33	81.67
	F_3	96.00	95.67	95.00	83.67	78.33
	F_4	96.33	96.00	94.67	84.00	75.00
I_3V_1	F_1	97.00	96.33	94.67	91.00	89.00
	F_2	96.33	96.33	95.00	90.67	89.00
	F_3	96.33	96.00	95.33	90.33	86.67
	F_4	96.67	95.67	94.67	89.67	84.00
I_3V_2	F_1	96.00	96.00	95.67	92.00	90.00
	F_2	96.00	95.67	94.00	90.33	87.67
	F_3	95.67	95.33	94.67	88.67	85.00
	F_4	96.00	95.67	94.67	87.67	83.67
I_3V_3	F_1	95.67	94.67	93.67	89.33	83.00
	F_2	95.67	94.67	94.33	89.00	83.00
	F_3	95.33	95.00	93.33	87.33	79.00
	F_4	95.33	95.00	94.33	88.00	79.33
I_3V_4	F_1	96.00	95.67	94.67	86.67	81.00
	F_2	96.00	95.67	94.67	87.00	81.00
	F_3	96.00	95.33	94.33	82.33	76.00
	F_4	96.00	95.67	94.33	82.00	73.00
I_4V_1	F_1	96.00	95.67	93.67	90.33	86.67
	F_2	96.33	95.33	94.00	89.00	86.00
	F_3	96.00	95.67	93.67	87.00	84.00
	F_4	95.66	95.33	93.67	86.00	80.00
I_4V_2	F_1	96.00	95.33	94.00	89.00	85.00
	F_2	95.66	94.67	94.00	88.67	84.00
	F_3	95.66	94.00	93.33	86.67	83.67
	F_4	96.33	94.00	93.33	86.00	80.33
I_4V_3	F_1	95.33	94.00	93.67	87.33	81.00
	F_2	94.66	93.33	93.00	84.00	80.33
	F_3	95.33	94.00	93.67	84.67	77.33
	F_4	95.00	93.66	93.33	85.00	77.00
I_4V_4	F_1	95.66	94.33	94.33	84.33	78.67
	F_2	95.66	94.00	93.67	85.00	78.00
	F_3	95.66	94.33	93.33	82.00	69.67
	F_4	95.33	94.33	94.00	80.00	69.00

viz. SA 75 (V_1), Sandal (V_2), Chenab 70 (V_3) and LU 26 (V_4) at the exposure periods ranging between 3–14 days. However, at the longest interval of 21 days it affected the germination of V_2, V_3 and V_4, 1.33–2.33% more than that observed under check (D_0), but because 14 days exposure period is sufficient to get complete kill of different stages of stored grain insect pests, therefore, even this amount of damage can also be averted. The next higher dose (D_2), 2 times the recommended dose, reduced the germination of wheat varieties tested between 1.33–3.00% during different exposure periods but it is not alarming as compared to the ravages of the insect pests (10–15%) to stored wheat. The use of still higher doses (D_3, D_4) of these fumigants is uneconomical as well as deterimental, and it has also been found that these doses of EDCT and Dowfume at longer exposure periods (14, 21 days) are more damaging to Chenab 70 (8.00–18.00%) and LU 26 (14.00–26.00%).

Blackith and Lubatti (1965) and Kamel *et al.* (1970b) found that methyl bromide did not affect the germination of treated wheat having low moisture content. According to Gostick (1970) and Kamel *et al.* (1970a) injury to wheat seed treated with methyl bromide increased as the rate of fumigant and moisture content increased as found in the present studies regarding the effect of EDCT, Dowfume, Phostoxin and Detia on the germination of SA 75, Sandal, Chenab 70 and LU 26 with varying moisture content.

Haq and Ulfat (1966) and Kamel *et al.* (1975) found that Dowfume at the rate of 15–30 lbs. per 1000 c.ft. and Phostoxin at 2.5–3.0 tablets/m³ reduced the germination of treated wheat. Strong and Lindgren (1960) also reported similar results with hydrogen phosphide.

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