TOXICITY OF SEED BORNE STORAGE FUNGI OF COWPEA (*Vigna sinensis* L.)-EFFECT OF FUNGICIDAL DRESSING ON SEED GERMINATION& RADICLE GROWTH

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ABSTRACT: Considering all the protein sources that might help tribal belt of Jharkhand's poor and malnourished population, none seems more promising or more practical than grain legumes, which famously deliver the amino acids needed to grow and repair tissues of brain , nerve and muscles as well as help to construct the enzymes necessary for normal life function.
Luckily there is a grain legume which can suit every local soil and climatic condition of Jharkhand and can be grown on almost every season, is cowpea. Its widespread occurrence and importance in the lives of most tribal and rural population and its intensive use as dietary protein source makes it a preferred choice of crop to study upon.
It is well established fact that the seeds are invaded by the fungi during storage. The effect of storage fungi on the cowpea seeds resulted in suppression in their germination. These fungi afflict seed deterioration which are reflected by various physiological, biochemical and cytological changes in seeds. Seed borne storage fungi though saprophytic in nature, affect biochemical disorder and pathological symptoms in the seedlings of crop plants.
The study involve studying the effect of dressing the seed with locally available fungicide and studying its effect on seed germination and radical growth, The fungicides commonly used for seed dressing in storage are Thiram, Captan, Bavistin, Difolatan and Dithane M-45. The study was conducted under three moisture level; 6.82% 7.68% and 9.87% and results are compared with control treated seed.

Key Words: Cowpea seeds, storage fungi, seed germination, seed deterioration, fungicidal dressing, moisture level.

INTRODUCTION:

Cowpea (*Vigna sinensis* L.) is a Kharif legume and is grown through India for green pods, dry seeds,fodder and green manure. The species is exceptionally rich in useful genetic diversity. The plant is deep rooted, vigorous in growth, and reliable in production. As in the case of many edible leguminous crops, the optimal utilization of cowpea as a food crop is hampered by numerous constraints. Many losses of cowpea seed particularly are due to the inadequate post harvest storage of the seeds[1] . Seeds become susceptible to fungal infestation under conditions of relative high humidity and temperatures [2,3,4] . Some of these fungi are known to produce toxic secondary metabolites, namely mycotoxins, that can lead to severe health implications in both humans and animals when contaminated seed is ingested[5]. Seed-borne fungi invade cowpea grains while still in the field or during storage causing seed rotting, mycotoxin contamination and loss of seed viability. The seed infection leads to low germination of seeds, and thus reduces yield loss both quantitatively and qualitatively[6,7]

Fungicides have been developed to protect plants against diseases, which cause serious problems such as loss of germination, abnormalities in seedling growth and change in biochemical activities. The aim was to test the germination of cowpea seeds treated with several fungicides and also studies the prevention of abnormalities in the seedling under various fungicides.The dressing of seeds, before storage, with different fungicides like Thiram, Captan, Bavistin, Difolatan and Dithane M-45 can help in reducing seed deterioration, increase germinability, reducing pathological symptoms and improving biochemical activities on seed. This process requires proper fungicide treatments of seed at controlled concentration.

MATERIAL & METHODS:

Common Cowpea variety Pusa-1 is cultivated in almost all the villages of Ranchi district .The stored seed was collected from the farmers and seed dealers of Ranchi .The seeds of cowpea was infested with the isolated storage fungi possessing their frequency 15% and above. The infested seed lots were stored in triplicate over glycerol solution to maintain 60, 70 and 80% R.H. at 30^0C. in sealed desiccators for a period of 30 days.The stored seed lots were surface sterilized and set in the moist blotters. The moist blotters were kept at 30±1°C for five days to record the germination. The emergence of the radical was accepted as germination of the seed. The growth of the radical was permitted for the next seven days to observe pathological symptoms in the radicle. The moist blotters were lightly made wet with autoclaved tap water on their drying.
For fungicidal treatment fifty gram of seed lot having different moisture level was allotted each for 0.1, 0.2 and 0.3 % concentration of : Thiram, Captan, Bavistin, Difolatan and Dithane M-45. For dressing the seed with fungicides, the requisite amount was taken over, and the seeds are kept in dry conical flasks and manually shaken for 5 minutes. These fungicides are commonly used for seed dressing in storage. The control lot of the seed was undressed or not treated with fungicides

RESULT & DISCUSSION:

Effect of fungicidal dressing on seed germination:

The result on the germination percentage of the fungicide dressed stored seed having different moisture level are presented in **Table 1.** The result showed that the germination (%) was found to be enhanced due to storage of the seed with fungicides as compared to the control. Among the fungicides Bavistin appeared superior to others. Next to follow was Difolatan. As regards the concentration of fungicides, 0.3% concentration proved to be the most effective. The seeds having 9.87%moisture even on 0.3% fungicidal dressing could not match in % germination of those seeds having less moisture content.

Table 1- Germination percentage (%)of the fungicide dressed stored seeds having different moisture levels

Moisture Level (%)*				
Fungicides	**Conc.**	**Mı**	**M_2**	**M_3**
Thiram	0.10%	90	87	72
	0.20%	94	91	86
	0.30%	100	100	91
Captan	0.10%	91	88	76
	0.20%	95	93	88
	0.30%	100	100	94
Bavistin	0.10%	91	89	78
	0.20%	96	94	90
	0.30%	100	100	96
Difolatan	0.10%	91	88	77
	0.20%	94	93	91
	0.30%	100	100	95
Dithane M-45	0.10%	90	88	76
	0.20%	94	91	85
	0.30%	100	100	90
CONTROL	-------	86	78	63

M_1 = 6.82, M_2 = 7.68, M_3 = 9.87

Abnormalities in the radicle of the seedlings raised from the fungicide treated seeds

The result of the abnormalities in the radicle of the seedling raised from the fungicide treated seeds are shown in Table 2, Any abnormality in the seedlings raised from the seeds having 6.82% and 7.68% moisture and treated with 0.1, 0.2 and 0.3% concentration of fungicides, could not be observed. The control seeds, too, were detected symptomless having 6.82% moisture. The symptoms such as Radicle smaller and curved were maximum in the seedlings raised from the control followed by 0.1% of Thiram, Dithane M-45 and Captan.0.2% fungicides were observed slightly less effective than 0.3%.

Table 2 - Abnormalities in the radicle of the seedlings raised from the fungicide treated seeds (expressed as % value)

				Moisture level % of seeds*	
Fungicides	**Conc.**	**Abnormalities***	**Mı**	**M_2**	**M_3**
Thiram	0.1	RSC	--	--	8
		RSBT	--	--	--
		RES	--	--	3
		CBNS	--	--	3
	0.2	RSC	--	--	2
		RSBT	--	--	--
		RES	--	--	1
		CBNS	--	--	1
	0.3	RSC	--	--	--
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	--
Captan	0.1	RSC	--	--	6
		RSBT	--	--	--
		RES	--	--	3
		CBNS	--	--	3
	0.2	RSC	--	--	1
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	--

	0.3	RSC	--	--	--
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	--
Bavistin	0.1	RSC	--	--	2
		RSBT	--	--	--
		RES	--	--	1
		CBNS	--	--	1
	0.2	RSC	--	--	--
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	--
	0.3	RSC	--	--	--
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	--
Difolatan	0.1	RSC	--	--	4
		RSBT	--	--	--
		RES	--	--	1
		CBNS	--	--	1
	0.2	RSC	--	--	2
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	
	0.3	RSC	--	--	--
		RSBT	--	--	
		RES	--	--	--
		CBNS	--	--	
Dithane M-45	0.1	RSC	--	--	8
		RSBT	--	--	--
		RES	--	--	4
		CBNS	--	--	3
	0.2	RSC	--	--	3
		RSBT	--	--	--
		RES	--	--	2
		CBNS	--	--	1
	0.3	RSC	--	--	--
		RSBT	--	--	--
		RES	--	--	--
		CBNS	--	--	--
CONTROL		RSC	--	--	16
		RSBT	--	--	5
		RES	--	--	7
		CBNS	--	--	8

* RSC - Radicle smaller & curved
* RSBT - Radicle smaller with Blackened Tips
* RES - Radicle Extremely Small
* CBNS - Cotyledons With Black/Brown Necrotic Spots

M_2 = 7.68, ***M_3 = 9.87.***

Based on the results, it can be inferred that storage of the seeds with high moisture content should not be stored with fungicides[9]. Also, 0.30% concentrations of Bavistin and Difolatan can be used for seed dressing before storage to enhance the germination. As regards the pathological symptoms in the radical part of the seedlings raised from the seeds dressed with fungicides, 0.35 Bavistin and Difolatan can be recommended followed by Captan with the caution, the seeds must have less than 9.87% moisture. Christensen[10]. has also recommended storing the seed having less than 10% moisture.

CONCLUSION:

Increase in moisture content of seeds stored under ambient condition is an important factor responsible for early decline in seed germinability. At lower concentration of Thiram germinability reduced by 20% with increase in moisture level, but germinability improved with higher concentration of Thiram and there is a loss of only 8% & 9% in germination when concentration increased from 0.2% to 0.3% respectively at

highest moisture level.For capton, Bavistin, Difolatan and Dithane M-45, the same trend can be seen, i.e. germination improved when fungicide concentration increased and moisture level changed.The application of different concentration of fungicide to the seeds in storage vis-à-vis their germination and affliction of abnormalities or pathological symptoms point out some important things. The germination % of the seeds having 6.82% and 7.68% moisture level was more with most suitable concentration of fungicide whereas it failed to reach to that extent having 9.87%moisture.The seeds with less moisture can also be stored as such without considerable damage of their germination. High moisture of the seeds provides suitable environment for the fungal growth in storage, there by the germination was adversely affected in control seed lots. The fungicidal dressing probably destroyed the fungal spores and protected the seeds from deterioration. To avoid fungal infestation, the moisture level of seed and its storage condition is of prime importance. Till now primitive methods of storage are used. Such conditions become favorable for fungal infestation in seeds, and led to aflatoxine contamination. Seeds can be stored for fairly larger period with no significant losses and economical value can be maintained if properly dried before storage, humidity condition are controlled and proper use of fungicides with proper concentration

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