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EFFECT OF *CALLOSOBRUCHUS CHINENSIS* INFESTATION ON SEED QUALITY AND MYCOFLORA OF PIGEON PEA SEEDS

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Ten seed samples of pigeon pea *(Cajanus cajan* L.) from Uttar Pradesh showed infestation of *Callosobruchus chinensis.* Which caused 45-93% insect damaged seeds, 58.75-95.5% seeds infested with insect egg and seed weight loss from 15-39.94%. Total 17 fungal species of 10 genera were isolated from the untreated, 1% pretreated insect infested samples. The fungi commonly associated with insect damaged seeds were *Alternaria alternata, A. tenuissima, Aspergillus flavus, A. niger, Fusarium oxysporum* and *Rhizopus nigricans.*

Keywords : *Cajanus cajan; Callosobruchus chinensis.*

Introduction

Legumes seeds are generally stored in jute bags, mud bins or cemented dark rooms for about six months or until harvest of next corp. During storage, qualitative and quantitative losses upto 8.5% have been reported in India[1]. *Callosobruchus maculatus* (F.), *C. analis* (F.) and *C. chinensis* (L.) are responsible for loss in weight, viability and nutrients in stored legumes. *C. chinensis* is the major cause of weight loss, reduced germination, quality deterioration[2] and harbours certain microorganisms which cause food poisoning and food spoilage[3]. Qualitative as well as quantitative changes in sugar and crude fibre content of stored legumes have been reported by Swaminathan[4]. Modgil and Mehta[5] studied qualitative losses in insect infested stored legume seeds. The consumption of endosperm by insects and utilisation of carbohydrates during seed respiration and insect activity, resulted loss in seed starch and its energy. Further, due to insect infestation and seed respiration, starch and carbohydrate are broken in to sugar[6].

The present work has been caried out to study the role of *Callosobruchus chinensis* on quality loss and mycoflora of pigeon pea seeds.

Materials and Methods

Ten seed samples of pigeon pea collected from Uttar Pradesh during the crop season, 1997 were subjected to dry seed examination, seed washing test and standard blotter method. For dry seed examination four replicates of 100 seed per sample taken at random was studied. The seeds associated with insect egg and damaged seeds were recorded along with per cent loss in seed weight during 12 months of storage. For seed washing test one gram seed per sample was taken randomly in two replicates. Each replicate was shaken separately in 10 ml of distilled water in 100 ml capacity conical flask on a Rotary Shaker at a speed of 100-150 rpm for 10 min. Equal amount of suspension was transferred from each flask to centrifuge tubes. The suspension was centrifuged at 2500 rpm for 20 min. The supernatant was decanted and sediment was resuspended in 2ml of lactophenol. Spore counts were made by a Haemocytometer slide (American Optical Company). Ten counts were made per subsample of 1gm. Spore load was estimated with the formula :

$$\text{Spore load per gram of seed} = \frac{N \times V \times 10,000}{W}$$

Where,

N = Average number of spores in central square of haemocytometer.

V = Volume of lactophenol added to the sediment i.e. 2ml

W = Weight of seeds.

In incubation test both untreated and 1% chlorine pretreated seeds (400 seed/ sample) for 2 minutes were sown on moistened blotters (standard blotter method). potato dextrose agar (PDA) plates and incubated at 24±2°C under 12 h alternating cycle of day light from fluorescent tubes and darkness for 7 days. Percent incidence of fungi were recorded on 8th day[7].

Results and Discussion

Seed samples of pigeon pea carried infestation of *Callosobruchus chinensis* which caused seed damage and loss in seed

Table 1. Percent infestation and average seed weight loss by *Callosobruchus chinensis* in ten seed samples.

Sample No. Studied	Seeds Damage (%)	Seeds with Egg (%)	*Average Weight of Normal 100 Seeds (gm)	*Average Weight of Damaged 100 Seeds (gm)	*Average loos in Weight of 100 Seeds (gm)	Loss in Seed Weight (%)
1.	93.0	95.5	7.26	4.36	2.9	39.94
2.	75.0	81.25	5.4	4.5	0.9	16.66
3.	45.0	58.75	7.6	6.2	1.4	18.42
4.	55.0	69.5	7.06	5.8	1.26	17.84
5.	80.0	88.75	7.26	4.53	2.73	37.60
6.	66.0	76.25	6.83	4.73	2.1	30.74
7.	79.0	88.0	5.8	3.83	1.97	33.96
8.	62.0	70.5	7.36	5.3	2.06	27.98
9.	64.0	73.5	6.5	4.4	2.1	32.30
10.	51.0	61.0	7.33	6.23	1.1	15.0
Total 10	(45-93%)	(58.75-95.5%)	(5.4-7.36)	(4.4-6.23)	(0.9-2.9)	(15-39.94%)

*= Mean of 3 replications

Table 2. Occurrence, spore load and incidence of fungi in seed washing and incubation tests.

Fungi	Seed Washing Test	Incubation Tests					
		Untreated		Pretreated		PDA	
	Spore Load/gm Seed	Incidence	% Range of Fungi	Incidence	% Range of Fungi	Incidence	% Range of Fungi
Alternaria alternata	4(1000-27,000)	4	2-24	3	1-18	3	1-15.5
A. tenuissima	5(1800-42,000)	5	1-36	2	1-14	2	0.5-17
Aspergillus candidus	4(800-13,500)	3	2-10	2	1-5	2	0.5-3
A. flavus	8(2300-5,64,000)	8	2-60	5	2.5-32	6	1.5-41
A. niger	3(1050-8,400)	4	1-16	3	0.5-11	4	0.5-13
Botrytis cinerea	-	2	2	2	5	-	-
Chaetomium globosum	2(250-850)	2	0.5-8	2	1-4	2	1-7
C. spinosum	-	1	1-3	-	-	-	-
Cladosporium cladosporoides	2(650-4,000)	2	1-4	1	0.5-2	1	1-3
Curvularia lunata	2(200-3,500)	2	1-2	1	1	1	1
C. pallescens	1(500-2,900)	1	1	-	-	-	-
Fusarium moniliforme	2(250-1,150)	2	2	1	1	2	0.5-2
F. oxysporum	5(2200-19,000	5	0.5-19	5	1-15	4	1-21
F. semitectum	-	1	1-12	-	-	1	1-3.5
Penicillium sp.	2(700-4,200)	2	1-3	1	1	-	-
Rhizopus nigricans	6(1300-8,300)	6	1-18	6	1-6	5	2-11
Trichothecium roseum	1(950-28,750)	1	0.5-5	-	-	1	1-2

weight. Per cent infestation in seed samples, incidence of mycoflora and extent of damage caused by the insect were studied.

Maximum 45-93% and 58.75--95.5% insect damaged seed and seeds infested with insect eggs respectively were observed (Table 1). The per cent loss in seed weight ranged from 15-39.94% Loss in weight and population of insect increased with increase in storage period.

Spore load per gm seed was determined in 10 samples. Fungal spores of 14 species belonging to 9 genera *viz* *Alternaria alternata* (1000-27,000), *Alternaria tenuissima* (1800-42,000), *Aspergillus candidus* (800-13,500), *Aspergillus flavus* (2300-5,64,000), *A. niger* (1050-8,400), *Chaetomium globosum* (250-850), *Cladosporium cladosporoides* (650-4000), *Curvularia lunata (200-3500), C. pallascens* (500-2,900), *Fusarium moniliforme* (250-1,150), *F. oxysporum* (2200-19,000), *Penicillium* sp. (700-4,200), *Rhizopus nigricans* (1300-8,300) and *Trichothecium roseum* (950-28,750). *Aspergillus flavus, Alternaria tenuissima, Fusarium oxysporum* and *Rhizopus nigricans* were the most dominant and occurred in 8,5,5 and 6 samples whereas *Curvularia pallescens, Trichothecium roseum, F. moniliforme* and *Aspergillus candidus* were observed in 1 to 4 samples only (Table 2).

On incubation 17 fungal species of 10 genera were recorded in untreated standard blotter test and 13 species of 8 genera in pretreated standard blotter method as well as potato dextrose agar plates respectively. The incidence of *Aspergillus flavus, Alternaria tenuissima, Alternaria alternata* and *Fusarium oxysporum* were relatively high and occurred in 4 to 8 samples whereas *Trichothecium roseum* and *Aspergillus candidus* were recorded only in 1 and 3 samples. The fungi commonly associated with insect damaged seeds were *Alternaria alternata, A. tenuissima, Aspergillus flavus, A. niger, Fusarium oxysporum* and *Rhizopus nigricans* (Table 2).

Callosobruchus chinensis is the major cause of weight loss and reduced germination and quality of seed. It also contaminates the seed lot with microorganisms which cause food spoilage[3].

In present study the seed lots carried 45-93% and 58.75-95.5% insect damaged seed and seeds with insect eggs respectively. The samples when kept under 12 month storage showed increase in insect population and insect damaged seeds. This caused sharp decline in per cent weight loss of seed. During storage, incidence of *Chaetomium globosum, Cladosporium cladosporoides. Fusarium oxysporum* increased whereas *Chaetomium spinosum, Fusarium moniliforme* and *Rhizopus nigricans* decreased considerably.

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