JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Biodegradation of hyacinth bean (*Lablab purpureus L.*) during storage

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Abstract: Food legumes are highly nutritious, rich in protein. They produce balanced diet to the predominant vegetarian people. *Lablab purpureus L.* belongs to fabaceae family, it is widely used by rural and urban people. Grown as a main crops in some areas. Globally it has been used a green vegetable. Legume seeds suffering low yields due to seed borne fungi. In the present investigation aimed to study the seed mycoflora, and assess the changes in germination percentage, moisture content and changes in the seed constituents like proteins, carbohydrates, fatty acids during storage.36 species and 18 genera were isolated *Alternaria , Aspergillus, Cheatomium, Cladosporium, Curvularia, Drechslera , Fusarium* and *Pencillium* were commonly isolated from agar plate and dilution plate techniques in both varieties. *Aspergillus* species were dominant fungi. Moisture and germination percentages were decreased during storage. Mian seed constituents like fatty acids increase and carbohydrates, proteins values were decreased during storage condition.

Keywords: Hyacinth bean, seed mycoflora, germination, storage period, seed borne fungi.

Introduction: Pulses are very important source of dietary proteins posses essential nutrients, amino acids, minerals and vitamins to the vegetarian people (1). Food legumes are rich in proteins and many of the countries used as a staple food. To prevalent food shortage attention is currently being focused on the exploitation of lesser known and non traditional plant resources (2).

Lablab purpureus L. belongs to the family fabaceae, commonly known as kidney bean, Indian bean and hyacinth bean. It is also used as a green vegetable in many countries in the world (3). It is grown as a mixed or main crops. It is underutilized crops mainly used by rural and urban area people. It suffers from low yields due to many of microorganisms mainly fungi which are seed borne in nature.

Fungi harbors seed and during congenial period they invade the seed and its constituents called deterioration. It is a catabolic process leads to the crop loss (4,5).They not only spoilage the seeds and also produce various mycotoxins (6).

In the present investigation aimed to study the seed mycoflora, and assess the changes in germination percentage, moisture content and changes in the seed constituents like proteins, carbohydrates, fatty acids during storage.

A. Brown seeds

B. Black seeds

C. Flowering twig

D. Collection of seed

Materials and methods: Two varieties of hyacinth beans i. e. Black and brown varieties were directly collected from the fields of chinthapally village, paderu mandal, Vishakapatnam district, Andhra Pradesh state, India. Collected seeds were stored in cloth bags for six months at room temperature for the study of storage fungi and biochemical analysis. Isolation of mycoflora was done by Agar plate method (7) and Dilution plate techniques (8).Germination and moisture percentages were determined through the standard methods of AOAC 1947 (9). Estimation of Carbohydrate content (10), estimation of fatty acid content (11) and estimation of protein content (12).

In the present study all the investigations were carried out with the seed samples were drawn every month from cloth bags and assess for the germination and moisture percentages, carbohydrate content, fatty acid content and protein content were present in the seeds.

Results:

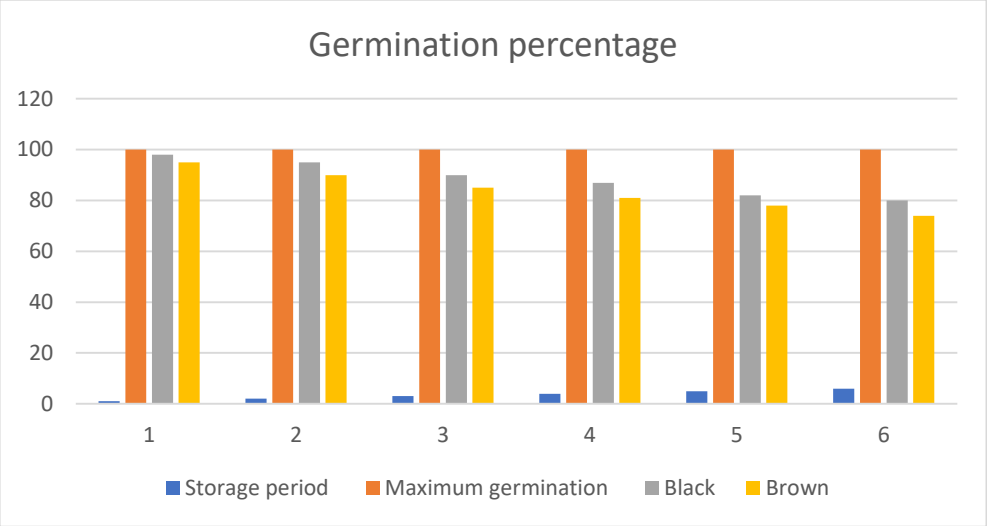
Seed mycoflora: Twenty species belonging to eighteen genera were isolated from brown seeds. Sixteen species and fifteen genera of fungi were isolated from black seeds. *Alternaria* , *Aspergillus, Cheatomium, Cladosporium, Curvularia, Drechslera* , *Fusarium* and *Pencillium* were commonly isolated from two methods in both varieties. All the field fungi gradually decreasing and storage fungi increasing with the increased storage period. Twenty two fungal species and fourteen fungal genera were isolated from lablab seeds .*Alternaria, Aspergillus, Cheatomium, Cladosporium, Curvularia* and *Fusarium* fungal species were isolated through blotter and agar plate methods(13). *Aspergillus, Alternaria* and *Fusarium* species were adversely affected the seeds in soyabean (14). *Aspergillus niger* and *Aspergillus flavus* were the dominant fungi to spoil the seed constituents. Tropical and sub tropical countries favors the growth of the *Aspergilli.*

Table.1 showing the total fungal organisms which were isolated from brown and black varieties of hyacinth beans.

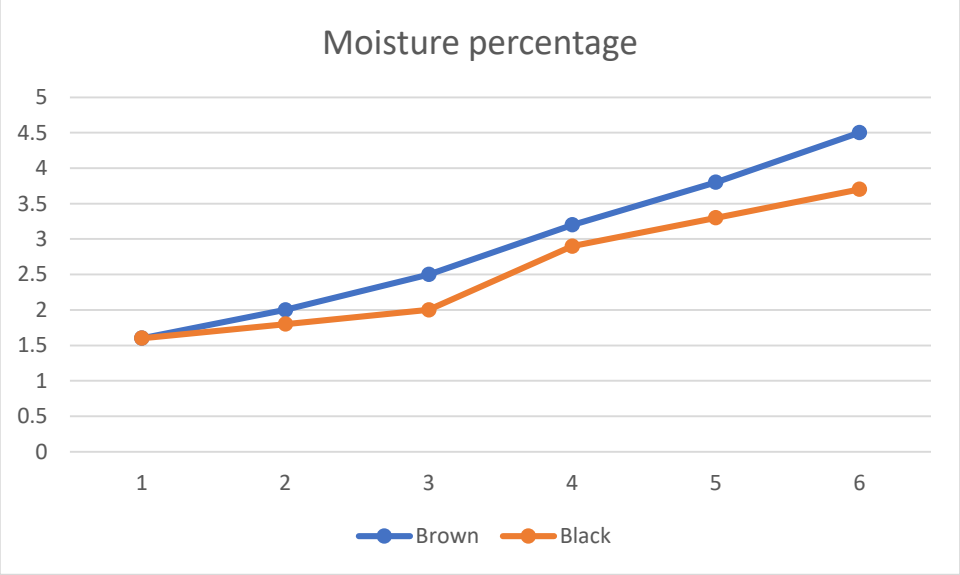
S. No	Name of the seed mycoflora	Fungal isolation methods	
		AGM	DPM
1.	*Alternaria alternata*	+	+
2.	*Alternaria humicola*	+	+
3.	*Aspergillus flavus*	+	+
4.	*Aspergillus flaviceps*	+	+
5.	*Aspergillus fumigatus*	+	+
6.	*Aspergillus candidus*	-	+
7.	*Aspergillus niger*	+	+
8.	*Aspergillus nidulans*	+	+
9.	*Aspergillus ochraceus*	+	-

10.	*Aspergillus sydowii*	+	-
11.	*Aspergillus tamarii*	+	+
12.	*Aspergillus terreus*	+	+
13.	*Aspergillus versicolor*	+	-
14.	*Botrytis cinera*	+	-
15.	*Cheatomium cochloides*	-	+
16.	*Cheatomium globossum*	+	+
17.	*Cheatomium murorum*	+	-
18.	*Cladosporium herbarum*	+	-
19.	*Cochlibolous spicifer*	-	+
20.	*Colletotrichum truncatum*	+	-
21.	*Curvularia lunata*	+	+
22.	*Drechslera sorokiana*	+	+
23.	*Drechslera halodes*	+	-
24.	*Fusarium oxysporum*	+	+
25.	*Fusarium roseum*	+	+
26.	*Macrophomina phaseolina*	+	-
27.	*Mucor varians*	+	+
28.	*Penicillium citrinum*	+	-
29.	*Penicillium notatum*	-	+
30.	*Phoma globossus*	+	+
31.	*Perenospora pisi*	+	-
32.	*Rhizoctonia solani*	+	-
33.	*Rhizopus nigricans*	+	+
34.	*Stachybotrys atra*	+	-
35.	*Trichoderma viridae*	+	+
36.	*Trichoderma album*	+	+

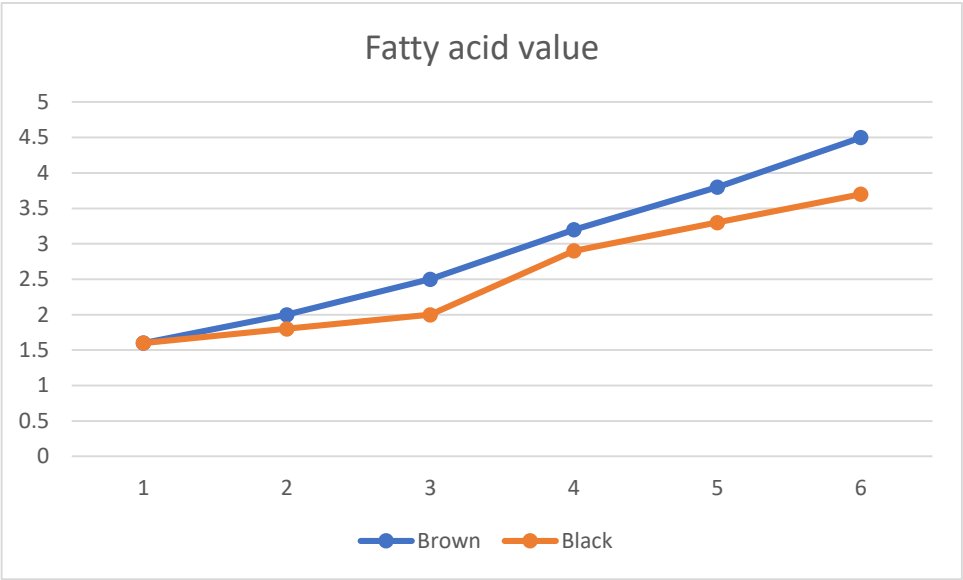
Germination percentage : Twenty five seeds per petriplate were plated on moist blotter paper to determinate germination percentage. Triplicate petriplates were used for every interval. Germination was gradually decreased with the increased storage period, from freshly harvested seeds to stored seeds. Loss of germination was observed in common pulses (15) Slight variations of low percentages were observed in the both seeds.



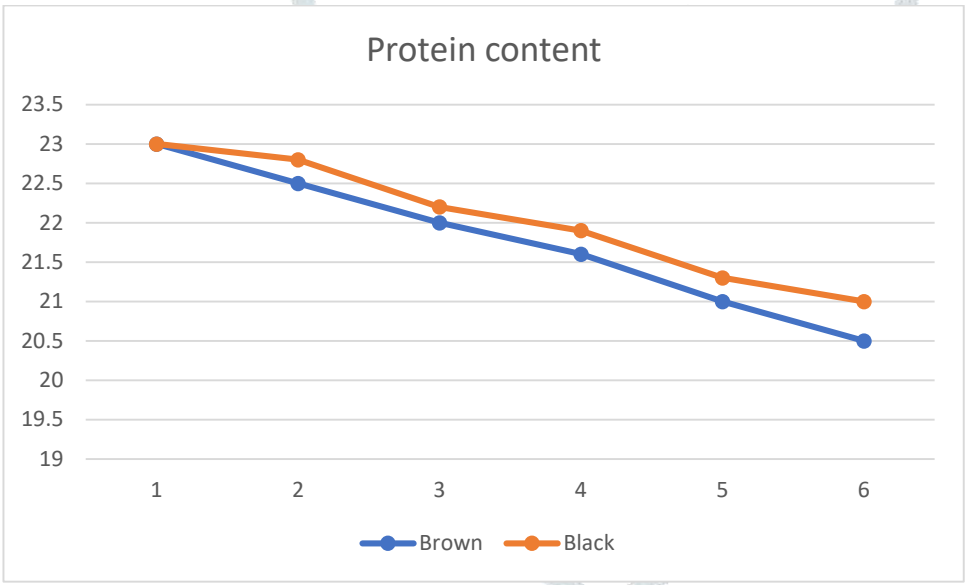
Moisture percentage: Moisture content play an important role in the seed longevity. It was decreased in the both samples with the storage period increased during six months of storage period. Decreased percentage of moisture content was observed in lentil during storage condition (16). Decreased percentage of moisture content observed in both the varieties.



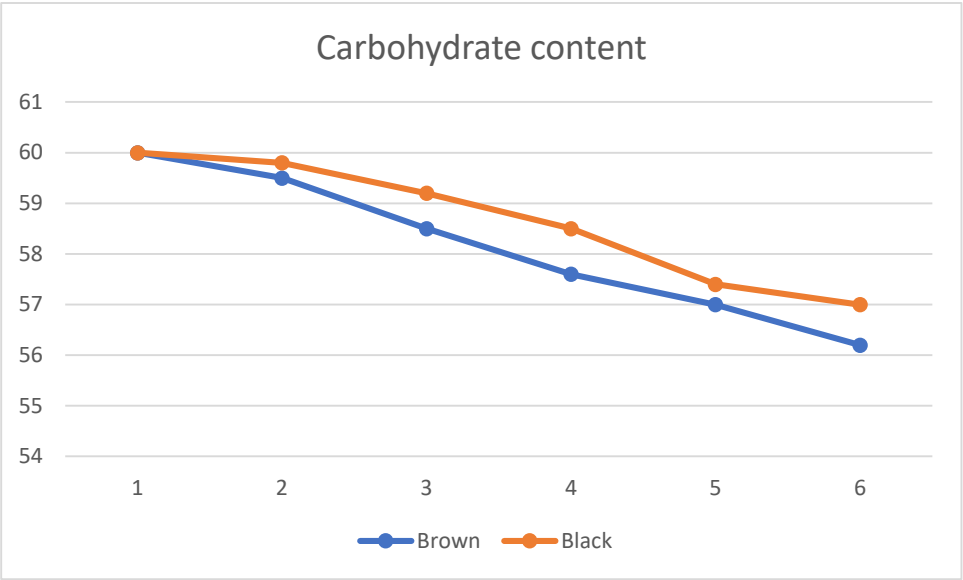
Fatty acid value: Seed samples showed an increase percentages of free fatty acid content during storage period. There was a gradual increase of free fatty acid content with an increased storage period recorded at maximum at six months of duration. Increased fatty acid values were observed in Red and black gram seeds during storage (17). High fatty acid value observed in brown seeds than the black seeds of hyacinth beans.



Protein content: There was a decrease in the protein content of the both varieties of the l*ablab* seeds from freshly harvested to storage seed samples. The decreased content of protein inversely proportional to the increased storage condition. Same results were observed in the in the seeds of pigeon pea, chick pea and green gram during storage (18). A slight variation was observed in both seeds of hyacinth bean.



Carbohydrates content: In the present investigation there was a decrease in carbohydrate value from freshly harvested seeds to storage seed samples during six months of storage period. Decreased content of carbohydrate values were observed in some pulses during storage condition (19). Brown seeds showed lower carbohydrate percentage than the black seeds.



Discussion:

Seed mycoflora: In the present study the seeds of *lablab purpureus L.* carry a ;arge number of pathogenic seed borne fungi. These food legumes exposed to a wide range of microbial contamination through the dust, micobiota in soil, nutrients from the water and through the rodents, birds, mechanical practices in the fields. Seed borne fungi were the major deteriorating agents than the other microorganisms (5).Which seriously affect the seed viability and seed constituents (20).Fungal invasion spoilage the quality, vigour and germination of the seeds (21)

In the present study there was a difference observed in the contents of seeds from freshly harvested to storage seed samples at 6 months of storage. Field fungi was gradually decreasing with the increased storage period. where as the storage fungi increased with the storage period increased.

Brown variety recorded high percentage of fungi than the black variety of the lablab seeds.

Germination percentage: In the present investigation germination percentage was decreased. Storage fungi destroy the mitochondrial walls in the seeds hence the seeds failed to germination. Hence the germination percentage was decreased during storage condition (17).

Moisture content: Moisture percentage plays an important role in degradation of seed constituents .It influence the fungal mycobiota to colonize upon the seeds during post harvest and storage conditions. Moisture content was decreased when the storage period increased (22).

Fatty acid value: Fatty acid content was increased in the storage seed samples when compared to the freshly harvested seed samples. By the action of storage fungi fatty acids may alter the cellular pH which harmful to the seed health (23).These results the foul odour and taste of seeds, this may effect the crop loss.

Protein content: Less amount of protein percentages were recorded in the storage seed samples than the post harvest seed samples. Through the actions of seed borne fungi protein percentages were reducing in storage samples. They breakdown the proteins into fatty acids (19). Seed borne fungi were the main responsible agents for the changes in the chemical constituents. (24).

Carbohydrate content: Decreased amount of carbohydrate contents were recorded in storage samples than the post harvested samples. Fungi deplete the seed carbohydrates and utilize them for their growth and development during storage (25).

Both the variety of seeds of lablab contaminated by the seed borne fungi even though brown colour seeds were damaged slightly when compared to the black seeds.

In the present investigation there are two varieties were taken to study their physiological and biochemical changes during storage. Based on their results, parameters concluded that brown variety seeds were highly sensitive. To combat the food crisis for future population we used to focus on new techniques to conserve food pulses from the various microorganisms. A special interest to be taken to conserve food legumes instead of using synthetic drugs suggested.

Acknowledgement: I would like to thank Head department of botany for providing necessary facilities and encouragement.

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