ISSN: 2394 5303 | Impact Factor 4.002(IIJIF) | Printing Area™ International Research journal | December 2017 Special Issue |

19

STUDIES ON BIOCHEMICAL CHANGES IN SOYBEAN SEED INFECTED WITH *FUSARIUM OXYSPORUM*

Vaishali, S. Chatage,

Hanmant., M. Lakde,

Mukundraj, B. Patil

Department of Botany,
Kai. Rasika Mahavidyalaya Deoni ,
Tq. Deoni., Dist. Latur

****

Abstract

Studies on Biochemical changes were observed from healthy and artificially inoculated Dithane M-45 resistant F_{10} and sensitive F_{11} isolates of soybean seed (variety MACS-13) caused by *Fusarium oxysporum*. There was a significant variation between healthy seed and infected seed which showed significant changes with respect to estimation of crude protein, total sugars, oil, amino acids (methionine , tryptophan), minerals (calcium, iron). Among them, crude protein (41.50 %) it was increased in healthy seed. But in Total sugars (26.40%) it was decreased in healthy seed as compared with infected seed followed by oil (13.80%) and others. Infected seed of soybean seed by both resistant and sensitive isolates reduced the contents of all parameters. This was more pronounced due to utilization of nutritious compounds of the soybean seed (variety MACS-13) by fungal pathogen for their growth and metabolism which causes deterioration of the nutritious compounds of the seed.

KEYWORDS: *Fusarium oxysporum*, biochemical changes, soybean seed (variety MACS-13), Dithane M-45

Introduction

Soybean (*Glycine max* (L.) *meril.* native of eastern Asia. The name of So might be derived from the Chinese names or "Sau" for Soybean. Soybean belongs t family *Leguminosae*, subfamily *Papilinoidae* tribe *Phaseoleace*. Soybean is considered most important cultivated oil crop, compr about 51% of the world production of veget oil. Also, because of its high protein conten has many commercial applications and soybe processing formed a large agro-indus complex. It is most common species recorded oil seed cum leguminous soybean crop (Glyc max L. Merrill.) fungi causing more than 30 p cent yield losses (Khan and Sinclair, 1992 a Mittal et al., 1993). Soybean is an ancient c domesticated around the eleventh century in North East China, after that it was spread towards South. Later on, it was known in Europ in 1721, in USA by 1804, in Brazil by 1903, East Africa by 1907 (Mali and Thottapp 1990). Soybean was known to India some wh between 1870-1880 (Andolle, 1884). Cultivati of soybean was initiated on large scale after th Second World War due to its nutritional value & multifarious uses (Synder & Kwon, 1987).

The common biochemical constituen like chlorophyll, sugars and phenols are importa in imparting resistance to the crop plants. B almost most all living animals and plant sho biochemical changes after infected by infectio agent (in Fishes by Mahananda et al., 2010 a in trees by Bora and Joshi, 2013). The prese investigation was made to evaluate th biochemical changes observed in soybean see (variety MACS-13) due to infected soybean see (variety MACS-13).

Materials And Methods

Total 13 isolates of *Fusarium oxysporum* were isolated from infected part of soybean seed and maintained on Czapek Dox agar medium (CZA). *Fusarium oxysporum* isolates were tested against Dithane M-45 fungicide by food poisoning test (Dekker and Gielink., 1979) Dithane M-45 resistant F_{10} and sensitive F_{11}; isolates were tested for biochemical analysis. This was studied by inject soybean seed with spore suspension of resistant and sensitive isolates. A deep well 1mm was prepared for spore suspension with the help of injection. After inoculation for 4 days, Seed were dried at 40°C in hot air oven and powder was obtained after crushing in grinder. Altogether 5 parameters were considered for analysis viz, Total sugars (Chenge and Bray 1951), crude protein (A.O.A.C. 1975), oil and minerals (calcium, iron) (Bangal and Gupta 1998).

Results And Discussion

Thirteen isolates of *Fusarium oxysporum* were tested against Dithane M-45 fungicide. The sensitivity (MIC) of Dithane M-45 resistant F_{10} showed 100ìg/ml while sensitive F_{11} showed 85ìg/ml. The sensitivity ranged from 80 to100 ìg/ml (**Table 1**). Biochemical analysis determined from soybean seed are shown in (**Table 2**), (**Fig.2.**). It was noted that the content of all parameters in the pathogen varied in sensitive and resistant strains. It was seen that crude protein were reduced in infected soybean seed when compared with healthy ones.

Table 1:
Sensitivity (MIC) of Dithane M-45 against *Fusarium oxysporum* isolates. Soybean seed (variety MACS-13)

Isolates	Locations	*Invitro* (MIC) µg/ml
F_1	Udgri	90
F_2	Parbhani	95
F_3	Deoni	98
F_4	Hingoli	95
F_5	Latur	99
F_6	Jalna	88
F_7	Beed	92
F_8	Amdapur	91
F_9	Aurangabad	87
F_{10}	Nilanga	100*
F_{11}	Dighol	85⁺
F_{12}	Ashta	95
F_{13}	Chakur	89

❖ Minimum Inhibitory Concentration (MIC)
* - sensitive +- Resistant

Table 2: Estimation of biochemical analysis of healthy and infected Soybean Seed (variety MACS-13)

Sr.No.	Estimation	Healthy	Sensitive F_{11}	Resistant F_{10}
1.	Crude protein (%)	41.50	26.82	29.90
2.	Total Sugars (%)	26.40	17.2	19.50
3.	Oil (%)	20.50	11.10	13.80
4.	**Amino acids(g/60gm N)**			
	Methionine	1.27	0.85	0.95
	Tryptophan	0.58	0.10	0.16
5.	**Minerals (mg/100gm)**			
	Calcium	300	260	286
	Iron	9.70	5.40	6.80
S. E. ±		40.849	35.859	39.367
C.D. 05		96.813	84.985	93.3
C.D. 01		142.97	125.5048	137.7842

Crude protein in the Seed infected with sensitive and resistant isolates were variable. Among them crude protein (41.50 %) was increased in healthy fruits, but reduced to sensitive (26.82 %) and resistant (29.90%). But in case of Total Sugars it was decreased (26.40 %) in healthy however, increased to sensitive (17.2%) and resistant (19.50%) followed by Oil. In case of Amino acids (Methionine and Tryptophan g/60gm N) and Minerals (Calcium and Iron mg/100gm) were decreased due to infection of both isolates. There was slight increase in total Sugars in seed inoculated with resistant and sensitive isolates in the healthy seed.

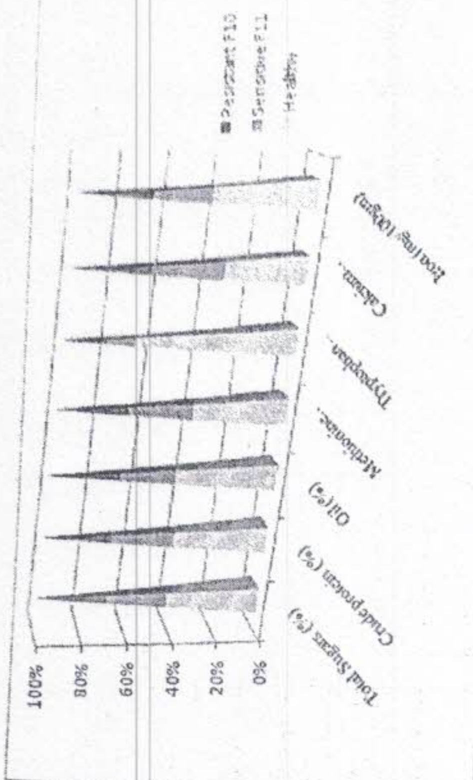

Fig. 2. Estimation of biochemical analysis of healthy and infected Soybean Seed

The comparisons of bio chemical contents of healthy and infected seed was made by estimating protein, oil, sugars (carbohyalrate) amino acids and minerals. It was observed that there was decrease in protein, oil, sugars, amino acids and minerals in infected seeds. These observations can be supported by the work of various scientists in case of soybean (Bangal and Gupta, 1998). The other workers also analysed the bio chemical containts of healthy and fungal infected seed of different crop plants. They are also in agreement with the descease in protein, oil, sugars, amino acids and minerals, (Singh, 1982., Mary Ragina and Tulsi Raman 1992., Kumar and Prasad, 1993., Gour and Singh 1995, Sinha and Sinha 1995)

These findings are in conformity with those reported earlier by many workers. Waghmare, et al. (2012) reported that the rose plants infected with leaf spot of rose showed significant increase in phenol content as compared to the healthy plant. Similarly, higher amounts of phenols were recorded for leaf spot resistant groundnut cultivars by Gupta et al., (19..) Sindhan and Jaglan (1987) and Sindhan et al. (1987). This may be explained by the fact that values of polyunsaturated fatty acids (linoleic and linolenic) decrease due to the lipid oxidation process, there will be an increase in the relative proportion of saturated fatty acids (Hildebrand 1992). Soybean oil is one of the most preferred vegetable oils used for food and other applications. Oil content ranges from 8.3% to 27.9%, with an average of 18.1% on a 13% moisture basis in soybean seed (Wilson 2004). The concentration of the total amino acids varies across different soybean genotypes and during the days of sprouting (Song et al. 2000).

CONCLUSION

Exposure on consumption of these spoiled Seed may be responsible for serious health hazards. The nutritional value of Seed chiefly depends on the quality and quantity of nutritive substances. Fungi cause Seed of soybean. Post-harvest and per-harvest losses of Seed are very high and diverse post infection; biochemical changes reduce their food and market value considerably. Results of study showed that fungal infection brought about nutritional changes in Seed. This was more pronounced due to utilization by fungal pathogen for their growth and metabolism and causes deterioration of the nutritious of the Seed.

REFERENCES

- **Bangal, U. S. and Gupta, D. N.** 1998. Nutritive value of promising cultures of soybean under konkan Agro-climatic conditions. J. Maharashtra Agric. Univ. 23(2): 121-124.
- **Sindhan, G.S, and Prashar, R.D** (1996). Biochemical changes in groundnut leaves due to infection by early and late leaf spot pathogen. Indian J. ... 126: 210-

212
- Singh, A.R. 1982. A study of the seed viability and vigour of the sorghum *Sorghum bicolor* (L.) Moench hybrids and their parents in relation to seed size. Ph.D. Thesis MAU, Parbhani. 88-92 P.
- Mary Ragina and Tulsi Raman 1992. Biochemical changes in stored carway seed due to fungi . J. Indian phytopath. 45(3): 384.
- Kumar, S. and Prasad, B.K. (1993). Total free amino acid content of mustard seed due to storage fungus *Aspergillus Flavus*. J. Indian Phytopath., 46 (3): 329.
- Gour, R.B. and Singh, R.D. 1995. Losses in seed weight, grain yield and protein content of chickpea seed due to *Ascochyte blight* infection. Indian J. Myco. Pl. Pathol. 25 (1): 18.
- Sinha, K. Kaushal and Sinha, Ashok. K. 1995. Effect of aflatoxin B, on some biochemical changes in some seeds of wheat varieties. J. Indian Phytopath. 48(2): 123-131.
- Khan, M. and Sinclair, J. B. 1992. Pathogenicity of sclerotia and nonsclerotia forming isolates of C. truncatum on soybean plants and roots. Phytopathology. 82: 314-319.
- Mittal, R. K., Prakash, V. and Koranne, K. D. 1993. Package of practices for the cultivation of pulses in the hills of the Uttar Pradesh. Indian Farming. 42: 3-5.
- Mali, V.R. and Thottapilly, A. (1990). Virus diseases of soybean in the tropics and subtropics . Rev. Pl. Path., 5: 1-55(suppl.2): 1-55.Andolle, V.C. 1884. Soybean, its values in dietetics, cultivation and uses, International Books and periodicals supply service, New Delhi. 479. p.
- Waghmare, M. B., Waghmare, R. M. and Kamble, S. S. 2012. Biochemical changes in rosa floribunda infected with carbendazim resistant and sensitive isolate of Alternaria Alternata. The Bioscan. 7(1): 101-102.
- Gupta, P. P., Gupta S. K, Kaushik, C. D. and Yadava, T. P. 1985. Biochemical changes in leaf surface washings of groundnut due to tikka disease, C. personata. Indian Phytopathology. 38: 339-340.
- Sindhan, G. S. and Jaglan, B. S. and Parashar, R. D. 1987. Changes in phenols and carbohydrates in resistant and susceptible cultivars of groundnut in relation to tikka disease. Plant Diseases Research. 2: 100-101.
- Sindhan, G. S. and Jaglan, B. S. 1987. Role of phenolic compounds and carbohydrates in resistance to tikka leaf spot. Indian J. Mycology and Plant Pathology. 17: 141-144.
- Hildebrand, D.F. 1992. Altering fatty acid metabolism in plants. **Food Technology**, Chicago, v.1, n.1, 71-74 p.
- Wilson RF. 2004. Seed composition. 3rd ed, In: H.R. Boerma, J.E. Specht (ed.). Soybeans: Improvement,production, and uses. American Society of Agronomy- Crop Science Society of America-Soil Science Society of America, Madison, WI. p.621-795.
- Song J, Kim S.P., Hwang, J.J, Son Y.K, Song, J.C, Hur H.S. 2000. Physicochemical properties of soybean sprouts according to culture period. Korea Soybean Digest. 17: 84-89p.
- Bangal, U.S. and Gupta, D.N.1998. Nutritive value of promising cultures of soybean under konkan Agro-climatic conditions. J. Maharashtra Agric Univ. 23 (2):121-124
- Synder, H.E. and Kwon, T.W. 1987. Soybean utilization. Van Nostrand Reinhold Company, New York, 346.P.
- Bora, M, and Joshi, N. 2013. A study on variation in biochemical aspects ofdifferent tree species with tolerance and performance index. The Bioscan. 9(1): 59-63, 2014.
- Mahananda, M. R., Behera, N. R. and Mohanty, B. P. 2010. Protective efficacy of l-ascorbic acid against the toxicity of mercury in Labeo Rohita (hamilton), The Bioscan. 3: 681-690.

Dr. Anil Chidrawar
I/C Principal
A.V. Education Society's
Degloor College, Degloor Dist.Nanded