SUMMARY

Incidence of *Aspergillus* species on different oil seeds

1. Different oil seeds viz. groundnut, soybean, sesame, sunflower and safflower were collected from different places at different stages from Marathwada region for isolation of *Aspergillus* species.

2. Ten dominant *Aspergillus* species like *A. flavus, A. fumigatus, A. glaucus, A. nidulans, A. niger, A. oryzae, A. parasiticus, A. terreus, A. ustus* and *A. versicolor* were isolated from oil seeds.

3. Soybean seed yields eight *Aspergillus* species were as *A. oryzae* and *A. parasiticus* are absent on soybean seed.

4. *Aspergillus flavus, A. niger, A. fumigatus, A. nidulans, A. terreus and A. ustus* were dominant on cotton seeds.

5. Blotter paper method yields less *Aspergillus* species from oil seeds as compared to Agar plate method.

6. On PDA medium maximum *Aspergillus* species were isolated as compared to RBA and GNA media.

7. Eight species of *Aspergillus* species *i.e. A. flavus, A. fumigatus, A. niger, A. oryzae, A. parasiticus, A. terreus, A. ustus* and *A. versicolor* were isolated on PDA medium from sesame seeds. Whereas on RBA only six *Aspergillus*
species viz. A. flavus, A. fumigatus, A. glaucus, A. niger, A. terreus and A. versicolor from sesame seeds.

8. Only five Aspergillus species viz. A. flavus, A. fumigatus, A. niger, A. parasiticus and A. ustus were isolated on GNA medium from sesame seeds.

9. In soybean, eight Aspergillus species viz. A. flavus, A. fumigatus, A. glaucus, A. nidulans, A. niger, A. terreus, A. ustus and A. versicolor were isolated on PDA. Whereas on RBA and GNA media Aspergillus species number was reduced.

10. From sunflower seeds, ten Aspergillus species viz. like A. flavus, A. fumigatus, A. glaucus, A. nidulans, A. niger, A. oryzae, A. parasiticus, A. terreus, A. ustus and A. versicolor were isolated on PDA.

11. Among seed abnormalities, discolored and undersized seeds showed maximum association of Aspergillus species qualitatively and quantitatively.

12. Pasari, Tag 45 and Ghungru varieties of groundnut showed maximum incidence of Aspergillus species.

13. Soybean varieties viz. Js-335, S1B and Eagle yielded maximum Aspergillus species were isolated.

14. All selected varieties of safflower seeds showed maximum diversity of Aspergillus species except variety Bhima.

15. Three varieties of sunflower viz. Lsu, LsF8 and Suraj showed maximum isolation of Aspergillus species as compared to Kargil variety.
Growth pattern and culture characteristics of different *Aspergillus* species.

16. *Aspergillus* species showed variation in its morphological character on solid medium. The growth pattern varies in different *Aspergillus* species like *A. flavus*, *A. fumigatus*, *A. glaucus*, *A. nidulans*, *A. niger*, *A. oryzae*, *A. parasiticus*, *A. terreus*, *A. ustus* and *A. versicolor*. The color of colony and diameter also varies where as the growth of the *Aspergillus* species on liquid medium shows variation in its dry mycelium weight, sporulation count, extra cellular pigments release in medium.

17. The growth pattern and cultural characteristic of *Aspergillus* species is also varies in different isolates, isolated from groundnut, soybean, sesame, sunflower and safflower. On liquid medium and solid, cultural character and growth pattern are recorded.

**DNA finger printing of *Aspergillus flavus* isolates**

18. In order to study the molecular characterization of *Aspergillus flavus*, twelve isolates were selected on the basis of variation in cultural character and growth pattern. For molecular characterization, ISSR technique is used, were five clusters are reported. The genetic similarity index and dendogram support the results.
**Lipase activity**

19. Lipase enzyme production was studied on substrate and non-substrate media, substrate media induced lipase production in all *Aspergillus* species.

20. Among carbohydrates lactose, fructose and sucrose induced lipase action in some *Aspergillus* species. While polysaccharides like CMC and starch inhibited lipase activity of *Aspergillus* species.


22. Potassium di-hydrogen ortho-phosphate induced lipase activity of *Aspergillus fumigatus*, *A. oryzae* and *A. versicolor* while sodium hydrogen ortho-phosphate increased lipase production of *A. glaucus*, *A. niger*, *A. parasiticus* and *A. versicolor*.

23. Lipase production of *Aspergillus flavus*, *A. fumigatus*, *A. nidulance*, *A. oryzae*, *A. terreus* and *A. ustus* were induced by di-sodium hydrogen ortho-phosphate.

24. Ferrus sulphate and disodium sulphate induced lipase activity of all the *Aspergillus* species. Whereas calcium sulphate and zinc sulphate retarded lipase production of some *Aspergillus* species.

25. Antibiotic like Norflaxacin, Ampicilin, Trioflan, Tetracycline and Almox. DT inhibited the lipase production in some species of *Aspergillus* species.
26. Vitamin C stimulated lipase production of all selected *Aspergillus* species. Where as Thiamin HCl, retard the lipase action of *Aspergillus niger*, *A. parasiticus*, *A. terreus* and *A. ustus*.

27. Maximum lipase activity of all *Aspergillus* species occurred in between 15 to 20 days of incubation period.

28. All the selected *Aspergillus* species showed maximum lipase enzyme production at pH 6.5 to 7.5 and at 20 to 30°C temperature.

29. Continuous light induced lipase enzyme activity in all the *Aspergillus* species as compare to dark and alternate dark and light.

**Biodeterioration of oil seeds**

30. Impact of ten selected *Aspergillus* species were studied quantitatively on biodeterioration of seeds content.

31. All selected *Aspergillus* species reduced dry weight content, cured fiber, reducing sugar, percent nitrogen, ash, calcium, phosphorus and fat content of groundnut, soybean, sesame, safflower and sunflower.

32. Maximum loss of dry weight in groundnut, soybean and safflower were caused due to *Aspergillus flavus*. Where as *A. niger* deteriorate maximum dry weight of sunflower and sesame.

33. *Aspergillus flavus* reduces the fiber content in groundnut, soybean, sesame, safflower and sunflower.
34. It was interested to note that *A. niger, A. parasiticus,* and *A. ustus* were responsible for increase in crude fiber content of groundnut, soybean and safflower.

35. *Aspergillus versicolor* deteriorate maximum protein content in groundnut, soybean and sesame. whereas *A. ustus* and *A. versicolor* were responsible for maximum reduction of protein content in sunflower.

36. Maximum reduction of nitrogen in groundnut, soybean and sunflower seeds were caused due to *A. terreus.* Where as in sesame and safflower maximum deterioration of nitrogen were caused due to *A. flavus.*

37. *Aspergillus glaucus* was most responsible for maximum reduction of ash content in groundnut.

38. In soybean maximum ash content was reduced by *A. fumigatus, A. nidulance, A. oryzae* and *A. terreus.*

39. *Aspergillus nidulance A. oryzae* were reduced maximum ash content in sunflower. Whereas in case of safflower *A. fumigatus, A. glaucus* and *A. versicolor* were responsible for maximum loss in ash content.

40. Maximum calcium in groundnut and safflower seeds was reduced by *Aspergillus flavus.*

41. *Aspergillus parasiticus* was responsible for maximum reduction in calcium content of soybean and sesame.
42. *Aspergillus niger*, *A. parasiticus* and *A. flavus* were responsible for maximum reduction in phosphorus content of groundnut, safflower and sunflower respectively.

43. Maximum loss in phosphorus of sesame was caused by *A. flavus*, *A. ustus* and *A. versicolor*.

44. Maximum fat content of ground, soybean, sunflower and safflower was reduced by *A. flavus*. Whereas *A. fumigatus* was mainly responsible for maximum loss of fat content in sesame.

**Effect of mycotoxins on oil seed germination**

45. Effect of culture filtrate *Aspergillus* species on oil seed germination was studied.

46. Culture filtrate of all selected *Aspergillus* species inhibited seed germination in all oil seeds.

47. Among all *Aspergillus* species, *A. flavus*, *A. niger* and *A. ustus* showed more toxic to seed germination of groundnut, soybean, sesame, sunflower and safflower.

**Qualitative estimation of aflatoxin**

48. Forty eight isolates of *Aspergillus flavus* were screened for aflatoxin estimation production by ammonia vapor test and HPLC.

49. Isolates Gp11.F3, Gp45.F3 and So80.F3 were isolated from groundnut and soybean and all these isolates were highly toxic according to ammonia vapor test.
50. All isolates of safflower and sesame did not produce highly toxic aflatoxin.

51. G2 aflatoxin was absent in all forty-eight isolates.

52. Most of the *Aspergillus* isolates did not produce aflatoxin on 10\textsuperscript{th} day of incubation.

53. Expect few isolates there was no production of aflatoxin at 15 and 45\textdegree C, whereas maximum production of aflatoxin was at 25 and 30\textdegree C.

**Interaction between *Trichoderma viridae* and *Aspergillus* species**

54. Interaction between *Trichoderma viridae* and *Aspergillus* species were study by co-culturing the mycelium of these fungi in 1\% sucrose solution and observation were taken at regular interval. It was found that, *Trichoderma viridae* inhibited growth of all *Aspergillus* species.