SUMMARY

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In the present investigation following studies were undertaken:

Cultural Studies

1. Four species of Fusarium viz.F.udum E. Butler (I.M.I No.334065), F. pallidoroseum (Cooke) Sacc. (I.M.I.No. 334064) F. oxysporum Schlecht (I.M.I.No.334066), and F. moniliforme J.Sheld (334072) were isolated from Pigean pea [Cajanus cajan (L.) Millsp.] field and seeds. Detailed cultural, pathological and solarization studies were conducted on these Fusarium species. These organisms were isolated using dilution plate method, purified and identified on the basis of morphological characters and the cultures were maintained in potato dextrose agar medium.

2. Organisms were grown on seven different culture media (one semisynthetic and six synthetic). The maximum growth was obtained on Richard's medium in F. udum, F. pallidoroseum and F. oxysporum and Czapek's medium in F. moniliforme. Since the sporulation was fair to excellent in modified Asthana and Hawker's medium 'A'

and it was easy to handle and manipulate according to the need of experiments, this medium was selected for further cultural studies.

3. All the four organisms tolerated a wide range of initial pH (2.0 to 10.0). F.oxysporum failed to grow at pH 2.5. The most suitable pH for good growth and excellent sporulation for all the species was 5.5. Thus for all subsequent cultural studies, pH of the medium was adjusted to 5.5.

4. The maximum growth and excellent sporulation of all the four species of Fusarium was recorded at 25°C. All the organisms studied were failed to grow at low temperature (5°C) and higher temperature (45°C) except F. udum, where a feeble growth was recorded at 45°C.

5. The influence of eleven different sources of carbon (six monosacchardies, three disaccharides and two polysaccharides) on growth and sporulation of four species of Fusarium was studied. The maximum growth (yield of dry mycelial mat) of F. udum was on Ribose. In F. pallidoroseum and F. oxysporum yield was in Glucose,while in F. moniliforme it was on sucrose.

Different organisms showed considerable variations in growth and sporulation on various carbon sources. They failed to grow on a medium devoid of any carbon source.

6. Utilization of mono-,di- and polysaccharides was studied chromatographically or by iondine test techanique. Among the monosaccharides, Ribose, Mannose and Glucose were preferred as nutrients, by all the fungi studied. They however,consumed these sugars with varying rates. All the organisms consumed L(+) Arabinose much earlier than its D(-) isomer. Except F. oxysporum all other fungi studied were failed to utilize lactose within the incubation period (15 days) Disaccharides were utilized through a hydrolytic pathway by the present organisms. Starch and Inulin were consumed with a moderate rate. No oligosaccharides were detected during the utilization of di- and poly saccharides as has been recorded by earlier workers.

7. Nitrogen is most essential for growth of fungi. Out of the eleven amino acids studied, L-cystine supported maximum growth in all the four species of Fusarium. No growth was recorded in medium devoid of nitrogen source. Chromatographic studies dealing with amino acids revealed diversity among the four fungi to

consume these organic compounds. None of the organisms studied in the present investigation could utilize dicarboxylic acids (Aspartic and Glutamic acids) within 15 days of incubation. L-Asparagine was found to be a good source of nitrogen to all the species. F. udum and F. pallidoroseum utilized this amino acid within 6 days of incubation, while F. oxysporum and F. moniliforme took 7 and 9 days respectively.

8. The effect of thirteen different sources of sulphur on growth and sporulation was investigated. Growth was absent in F. udum and F. moniliforme over sulphur lacking medium, while a nonsignificant growth was recorded in other two species. Sulphates of all the metals except Lithium and Zinc were found toxic to the present organisms. F. pallidoroseum failed to induce growth on zinc sulphate also. In the present investigation magnesium sulphate was found to be a good supporter of growth in all the species. Growth of the present organisms was poor in potassium meta bisulphite. it was toxic to F. pallidoroseum.

9. Effect of hydrogen ion concentration on nitrite nitrogen utilization was studied and found that, acidic media were not supporting growth of the fungi

which indicates the toxicity of nitrite nitrogen at lower pH F. oxysporum failed to grow in whole acidic range (pH 2.0 to 6.0) while, others showed growth from pH 5.8 onwards. Maximum dry weight was recorded at pH 8.0 in all the organisms.

Solarization Studies

10. Pigeon pea varieties viz. DPPA 85.5 ICP-2376 and LRG-30 (Procured from Directorate of Pulse Research Station, Kanpur) and one variety from local market were grown in the field for microflora (Rhizosphere and Non-Rhizosphere) and solarization studies. Growth study was conducted. length as well as fresh weight of shoot and root were maximum in DPPA 85.5 in comparison with other three varieties.

11. In rhizosphere study, rhizosphere and non-rhizosphere regions showed a wide difference in microbial population both qualitatively and quantitatively. Non-rhizosphere soil recorded more number of fungi than rhizosphere soil. Good amount of bacteria and actinomycetes were present in rhizosphere as well as nonrhizosphere soil. Rhizopus nigricans was the only fungus present both in rhizosphere and nonrhizosphere soils of all the four varieties of Pigeon pea.

12. Solarization studies conducted with polyethylene sheets, were found suitable for increasing soil temperature and subsequently altering microbial population. Transparent polyethylene sheet having 0.03 m.m. (300 gauge) thickness was found efficient to increase ths soil temperature (46°C). But, it was not durable for long term use. Out of the four coloured polyethylene sheets used for solarization, blue coloured one gave promising results in increasing temperature of soil (42.0°C). Red colour was not persistent,so not used in further studies.

13. A marked shift in microbial population was observed after 15 days of solarization in the peak summer months. Microflora was deminished after solarization. A total absence of Rhizopus nigricans was observed in solarized soil. Mucor population was reduced to half while, Aspergillus and Penicillium population increased.

14. Effect of soil amendments with solarization on microbial population was carried out by incorporating leaves of medicinally important plant. Leaves of 'neem', Colotropis and 'nilgiri' were tried. Out of these 'neem' produced maximum drift in microflora.

Bacterial population was increased in Calotropis amended soil. Fusarium udum was not isolated in any case.

Pathological Studies

15. Morphology of the four Fusarium species was studied with the help of light as well as electron microscopic (SEM) observations. Camera lucida diagrams were made to depict different type of conidia (micro- and macroconidia), chlamydospores and conidiphores.

16. In pathogenicity test, F. udum induced maximum percentage of wilting in Pigeon pea seedlings, followed by F.oxysporum, F. pallidoroseum and F. moniliforme. Pathogensity test conducted under laboratory conditions (in culture filterate) revealed that, an extra cellular toxic substance was produced and it has a vital role in the causation of wilt symptoms in Pigeon pea. Fusaric acid was detected maximum in F.udum. All the species studied can produce Fusaric acid in adequate amount to produce wilt symptoms in Pigeon pea.

17. In order to find out the thermal death point of four

Fusarium species, spore suspensions were exposed to different temperatures (40°C to 60°C). F. udum had less thermal death point (45°C), while it was 57°C for F. moniliforme.