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RESEARCH ARTICLE

# EVALUATION OF FUNGICIDES FOR MANAGEMENT OF FUSARIUM WILT OF PIGEONPEA CAUSED BY FUSARIUM UDUM BUTLER

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## ABSTRACT

**Eight different fungicides viz Mancozeb (0.2%), Antracol (0.2%), Indofil Z-78 (0.2%), Acrobat (0.2%), Matco (0.2%), Roko (0.2%), Taquat (0.2%) and Blaster (0.2%) were evaluated against *Fusarium udum* under laboratory and glass house conditions. It was observed that Mancozeb (0.2%) was the best fungicide which completely inhibited the growth of fungus, followed by Antracol (0.2%), Indofil Z-78 (0.2%), Acrobat (0.2%), Matco (0.2%), Roko (0.2%), Taquat (0.2%) and Blaster (0.2%) which are also able to checked the fungal growth to some extent under laboratory. Low wilt incidence with 66.7% was found from seed treated with mancozeb followed by Antracol, Blaster , Acrobat ,Taquat, Indofil Z-78, Roko and Matco in pot experiment.**

**Key Words :** Pigeonpea, wilt, *Fusarium udum*, Fungicides, seed treatment, germination.

Pigeonpea (*Cajanus cajan* (L.) Millsp.) which is also known as Arhar, Tur, Redgram, Cangopea and Gandul is an important pulse crop in Indian subcontinent. Besides India, it is also grown in South East Asia, Africa and America. India produces 2.89 mt. of pigeonpea from 4.42m ha. of land with productivity of 6.55q/ha which contribute about 90% of total world production (Anonymous 2011). In india, the crop is mainly grown in Andhra Pradesh, Bihar, Uttar Pradesh, Karnataka, Gujarat, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu. In Uttar Pradesh, it is grown on 0.39m ha area producing 0.29mt with an average yield of 9.14q/ha which is much lower than potential yield of 2000 to 2500 kg/ha with improved varieties (Anonymous, 2011). The main region of poor yield of pigeonpea is mainly due to biotic stresses like diseases and insect pests. The crop is infected by 210 pathogens which include 83 fungi, 4 bacteria, 19 viruses and mycoplasma and 104 nematodes reported from 58 countries. However the maximum number has been reported from India with 98 pathogens (Nene *et al.*,

1996).The main destructive disease in India are wilt, sterility mosaic, Phytophthora blight and Alternaria blight. Among them Fusarium wilt caused by *Fusarium udum* Butler is one of the most widespread and destructive disease in India mostly in Uttar Pradesh, Madhya Pradesh, Bihar and Maharashtra. The disease was first described by Butler from India in 1906 (Butler, 1910). The crop suffers heavily due to *Fusarium* wilt in the major growing areas resulting into huge production losses (Vishwa**d**har *et al.*, 2005). The annual loss in pigeonpea due to wilt alone in India has been estimated to US $ 71 million (Reddy *et al,*. 1993). In Bihar and Uttar Pradesh, 5-10 per cent losses in standing crop are common feature every year (Singh, 2006). Hence, for minimizing the losses, there is a need to identify best effective and inexpensive method for management of disease and there is no doubt that till date chemical control is the best method for management of plant diseases. Considering the point in view, the present investigation was carried out to evaluate fungicides for wilt management.

## MATERIALS AND METHODS

### Collection of wilt infected pigeonpea plants

Pigeonpea plants showing characteristic symptoms of Fusarium wilt were collected from Student Farm of C.S.Azad University of Agriculture and Technology, Kanpur (U.P.). Infected parts of pigeonpea plants were cut from roots and stems latter kept in rough dry envelopes especially meant for the purpose. Each envelope was marked clearly mentioning location, variety, date of collection etc. and were brought to the laboratory. The samples were dried for 24 hours in shade in order to remove excess surface moisture. After drying, the samples were kept in B.O.D. incubator in paper envelop and maintained at 6 to 8 °C for isolation and further studies.

### Isolation of pathogen

The diseased parts of pigeonpea samples showing distinct characteristics of wilt symptom, were selected for isolation of the pathogen. The selected roots, collar region and stem were washed with fresh sterilized water in order to remove the dust particles and surface contaminants. The diseased parts were then cut into small bits with some healthy portions with the help of sterilized scalpel and forceps. The cut pieces were surface sterilized with 0.1 per cent mercuric chloride solution under aseptic condition inside a laminar flow and washed thoroughly 3 to 4 times with sterilized water to remove the trace of mercuric chloride. Excess moisture was removed by placing these in the fold of sterilized blotting papers. The pieces were then transferred in Petri plates with the help of sterilized needles. Petri plates used in the experiment were previously sterilized and poured with 2 per cent modified Czapek-Dox-Agar medium. Three to four pieces of diseased parts of pigeonpea were placed in Petri plates of equal distances from each other. The Petri plate were transferred at 28±2°C for 7 days in an incubator. As soon as the mycelial growth was visible around the pieces, the hyphal tips from the advancing mycelium were cut and transfered into the culture slants containing Potato Dextrose Agar (PDA) medium for purification, identification and maintaince of pure culture by single spore isolation technique.

### Evaluation of fungicides against *Fusarium udum*:

The 8 fungicides like Acrobat, Indofil-Z-78, Antracol, Matco, Roko, Taquat, Mancozeb, Blaster, were evaluated against the pathogen under laboratory conditions to screen out the best fungicides upon their inhibitory effect on the growth of the fungus (*Fusarium udum*). The efficacy of fungicides were tested against the pathogen by "Food Poison Techniques" as described by Schmitz (1930) in which required quantity of each fungicide was thoroughly mixed with 100 ml of sterilized Potato Dextrose Agar medium contained in 150ml flasks. It was then mixed thoroughly and was poured in Petriplates and allowed to solidity. Each treatment was replicated three times. One set of control was also kept in which the medium was not mixed with fungicides. Five mm diameter of

fungal colony from 7 days old culture of *F. udum* was cut with the help of cork borer was inoculated in each Petridish at the center. These inoculated Petri-dishes were incubated at 28±1°C and after 10 days of the incubation, the fungal growth was recorded in each petriplate separately.

**Effect of seed treatment with fungicides against the disease in pot culture experiments *(in vivo)***

Eight fungicides viz Acrobat, Indofil Z-78, Antracol, Matco, Roko, Taquat, Mancozeb and Blaster which were found effective under laboratory condition were further reevaluate as seed dresser. The seeds of Pigeonpea variety "Bahar" were treated with fungicides in their recommended doses well before 48hrs of sowing in such a way so that the entire surface of seed was covered with the fungicides. The experiment was conducted in pot under glasshouse condition during 2012-13. 15 treated seeds were sown per pot filled with test organism (2%) by weight of the soil in pot. The experiment was laid out in Completely Randomized Design (CRD) with three replications. The observation of the seed germination and wilt incidence were recorded.

## Results and Discussion

**Screening of fungicides against *Fusarium udum in vitro***:

Eight fungicides were tested against the pathogen under *in vitro*. The evaluation of the best fungicides was done on the basis of the inhibit of the growth of the fungus by the agar plate method after 10 days (Fig.-1)It is evident from the results of Table-1 showed that out of eight different fungicides tested in laboratory, Mancozeb (0.2%) completely inhibited the growth of fungus, followed by Antracol (0.2%), Indofil Z-78 (0.2%), and Acrobat (0.2%) representing 0.01cm. diameters of a fungal colony. Rest of the fungicides was also found effective to check the growth of the fungus.

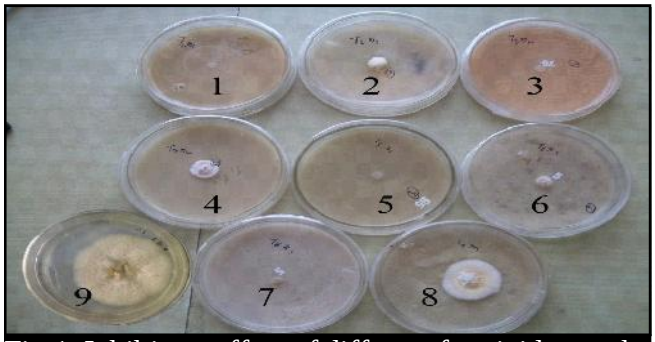

Fig.1: Inhibitory effect of different fungicides on the growth of *Fusarium udum in vitro*

**Effect of seed treatment with fungicides against the wilt disease under pot culture experiment *(in vivo)*.**

Eight fungicides found effective in laboratory conditions were tested for their effectiveness in pot culture experiment.

It is evident from the Table-1 showed that seed treatment of variety 'Bahar' a highly susceptible with 8 fungicides were found significantly effective in raising seed germination over control under pot culture experiment. Percentage of seed germination was minimum in untreated control and maximum in Mancozeb (93.33%) and Antracol (86.67%) treated seed, followed by Acrobat (80.00%), IndofilZ-78 (73.33%), Matco (46.67%), Taquat (40.0%). The Blaster and Roko were found least effective among all fungicides, showing (26.67%) germination.

On the other hand as per wilt is concerned it has found that all the fungicides are significantly superior over control. Among the fungicides, mancozeb was found most effecting showing 6.67% wilt incidence against control (66.67%). The rest of the fungicides were also found superior over control but inferior to mancozeb. The present findings are also supported by several workers in India. **(**Shukla *et al.* 1981, Singh Chhatpur, 2011, Ali, 2007, Anonymous 2010) noted the effect of Bavistin, Topsin-M, Captan as fungistatic even at low concentration. The other fungicides Bavistin,

Table 1: Evaluation of different fungicides on the growth of *Fusarium udum*, seed germination and wilt incidence of Arhar.

| Sr. No. | Fungicides | Dose percent | Average diameter of fungal growth (cm) | Germination percent | Wilted Plants Percent |
|---|---|---|---|---|---|
| **1.** | Acrobet | 0.2 | 0.01 | 80.00 | 20.00 |
| **2.** | Indofil Z-78 | 0.2 | 0.01 | 73.33 | 26.67 |
| **3.** | Antracol | 0.2 | 0.01 | 86.67 | 13.33 |
| **4.** | Matco | 0.2 | 2.30 | 46.67 | 33.33 |
| **5.** | Roko | 0.2 | 2.80 | 26.67 | 26.67 |
| **6.** | Taquat | 0.2 | 4.10 | 40.00 | 20.00 |
| **7.** | Mencozeb | 0.2 | 0.00 | 93.33 | 06.67 |
| **8.** | Blaster | 0.2 | 4.50 | 26.67 | 13.33 |
| **9.** | Control | | 7.90 | 20.00 | 66.67 |
| | CD at 5% | | +0.352 | | |

Carbendazim, Raxil (tubeconazole) & Kalisena were effective in controlling wilt of pigeonpea and get highest crop yield. Sinha *et al.* (2003), Mayur *et al.*, (2001) and Maheswari *et al.*, (2008) Agarwal *et al.* (2003) recommended seed treatment with Carbendazim + Thiram (1:2) 3g/kg seed, reduced the incidence of wilt of pigeonpea *Fusarium udum*.

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