



Research Article

## Effect of Botanical Extracts and MPG (Modified Panchagavya) on Chilli Wilt Incidence Caused by *Fusarium oxysporum*

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### Abstract

Chilli plants affected by wilt symptoms initially shows drooping and yellowing of lower leaves followed successively by younger leaves at the time of flowering. Then upward and inward rolling of the leaves later, whole plant get wilted and dies within 30-40 days. In the present investigation it was found that among the different botanical extracts and natural product MPG (Modified Panchagavya) treatments lowest percent disease incidence was recorded in Garlic extracts (30%) followed by Darrek (36.66%), MPG (43.33%), Wild sage (46.66%) and Nongmangkha (46.66%) as compared to 73.33% in case of untreated control.

**Keywords:** Chilli Wilt; *Fusarium oxysporum*; Modified Panchagavya; Percent Disease Incidence

### Introduction

Chilli is an important Spice crop known all over the world. In India Chilli rank first among all the spices with the share of 33.7% in the total production [1]. India is the largest producer of Chilli in the world accounting for over 45% of the total area under cultivation and the largest exporter of Chilli exporting 2.5 to 3 percent of its produced. In Manipur north eastern state Chilli has been known since ancient times as one of the most important spice crops. It is widely grown as Summer crop in an area of 10140 hectares with total production of 6080 tonnes [2]. Some of the popular Chilli species grown in the state are Tree or King chilli (U-morok), Bird eye chilli, Black scented chilli, Meetei morok and the famous Sirarakhong chilli known as Hathei which have been granted GI tag recently. The chill fruits owe its pungency and acidity due to the presence of pungent principle called Capsaicin (*Oleorescin capsicin*). It is also rich in vitamin-C along with a small amount of vitamin-E and other food value.

Chilli is known to suffer from various diseases caused by fungi, bacteria, virus, nematodes which reduce the yield potential of the crop. Among the fungal diseases affecting the Chilli crop, Wilt disease caused by *Fusarium* species is a serious one which results in total or partial killing of the standing crops. The fungus invades the vascular system of the plant causing vascular discolouration after developing through root system to base of the stem. The symptoms appear as yellowing and wilting of foliage, first starting from the lower leaves

and then woody tissue of the stem turns brown and later kill the plant. Sarhan and Sharif (1986) [3] worked on the incidence and severity of pepper wilt caused by *Fusarium oxysporum* f. *Sp. redolens* and *Fusarium* wilt of Chilli caused by *Fusarium annuum* L. They also reported that the disease was characterized by inward and upward rolling of the leaves and wilting of the plant. The disease is soil borne. In Manipur *Fusarium* wilt disease of Chilli was most prominent and occurs in severe forms. Since, most of the management practices are by the use of chemical which is known for residue effect on environment and humans. Therefore, the present work is taken up based on the use of natural products like Modified Panchagavya (MPG) and indigenous botanical extracts in managing the chilli wilt disease.

### Materials and Methods

#### Isolation and identification of pathogen

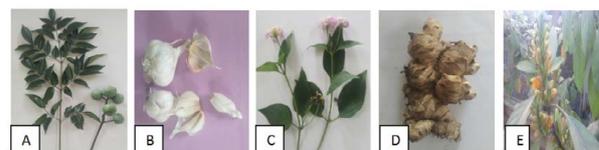
Chilli plants showing typical wilts symptoms was collected from the farmers field and brought in the KVK-Senapati district plant pathology laboratory for isolation. Isolation was made from discoloured vascular tissues from collar and root region of an infected plant by cutting into small pieces of 1 mm bits. These bits were surface sterilized with 1% Sodium Hypo Chloride (NaOCl) solution for two minutes followed by three times serial washing in sterile water. The sterilized bits were then placed aseptically on Potato Dextrose Agar (PDA) medium in sterilized plates and incubated at  $27 \pm 1^\circ\text{C}$  for five days. Then the observations was taken for the development of the fungus and purified by single hyphal tip method (Figure 1).

#### Preparation of botanical extracts

The aqueous botanical extracts of five different indigenous plants grown in Manipur viz. Garlic bulb (*Allium sativum*), Ginger rhizome (*Zingiber officinale*), Wild sage leaves (*Lantana camara*), Darrek (*Melia azedirach*) and Nongmangkha leaves (*Phlogacanthus thyrsoiflorus*) was collected and washed with tap water followed by sterile water and dried in shade for 24 hours to remove the excess moisture. The plant materials was weighed and crushed with the help of a sterilized mortar and pestle and made solution i.e., 1 g per 1 ml sterile water (1:1, w/v). The botanical extracts was filtered in double layer muslin cloth. Thus, this formed the standard 100% botanical extracts solution required to be used in the experiment.

#### Preparation of Modified Panchagavya (MPG)

In Sanskrit Panchagavya mean a combination of five products procured from cow (Milk, curd, ghee, dung and urine). It is an ancient ritualistic practice prescribed in Hindu scriptures to administer



**Figure 1:** Different botanicals use in experiment: A-Darrek (*Azadirach melea*), B-Garlic (*Allium sativum*), C-Wild Sage (*Lantana camara*), D-Ginger (*Zingiber officinale*), E-Nongmangkha (*Phlogacanthus thyrsoiflorus*).

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Panchagavya to human beings under many conditions of ill health, convalescence and as spiritual purifying agent [4].

In the case of our present investigation a Modified Panchagavya (MPG) was prepared following the method of Jahangirdar 2001 [5]. For preparing 1 litre MPG slurry it require the following ingredients cow ghee-20 ml, curd-50 ml, milk-50 ml, cow urine-480 ml, cow dung-400 g, common salt-20 g and baking yeast-10 g. All these ingredients were thoroughly mixed and allowed to ferment for 10 days with twice stirring daily. This crude fermented product was diluted 10 times with sterile water and this preparation is now taken to be as 100 percent standard solution. The diluted preparation was filtered through two layers of muslin cloth and the filtrate was used in the experiment at any desired level of concentration. The pH of the mixture was recorded on zero day and at ten days of the incubation of the mixture (Figure 2).

### In-vivo test

Effect of botanical extracts and modified Panchagavya (MPG) on the wilt incidence of Chilli was carried out in pot experiment during Kharif, 2019-20 by using local susceptible Chilli cv. viz. Jiri collected from the Department of Horticulture, Manipur and by following the methods of Haseeb 2005 [6]. Pot study was carried out in 15 cm top diameter earthen pot filled with 1 kg sterilized sandy loam soil. Botanical extracts and MPG were tried at their best concentrations i.e. Wild sage (5%), Darrek (15%), Nongmangkha (10%), Ginger (15%), Garlic (10%) and MPG (15%), and fungicides Carbendazim (0.1%) was used as check. Soils were drenched with each treatment one week before transplanting the chilli seedlings. Twenty days old seedlings of Chilli cv. Jiri was transplanted singly in each pot. The fungus was multiplied on PDA medium under aseptic conditions in

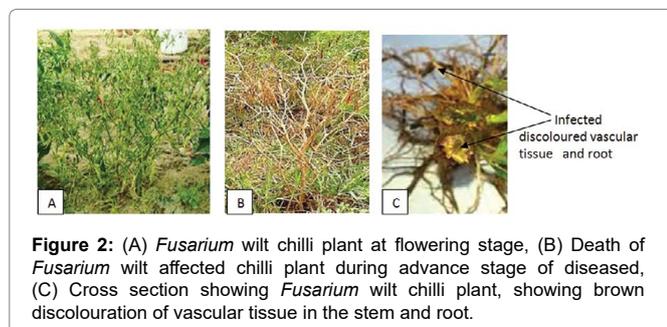
petriplates. When the medium was fully covered with fungal growth (seven days old), the growth was collected with the help of a sterilized scalpel and washed with 100 ml of sterile water. The contents of each plate were filtered through muslin cloth to get suspension. The suspension was diluted to concentration of  $4 \times 10^8$  spores/ml of sterile water. After three days of transplanting the prepared spore suspension of *Fusarium oxysporum* were inoculated by pipetting 5 ml of spore suspension pouring around each seedling. The experiment was carried out in Randomized Block Design (RBD) with three replications of each treatment was taken. However, simultaneously pots inoculated with *F. oxysporum* alone without any treatments served as control. Soil drenching was repeated three times at 20 days interval. Plants were kept under observation and disease incidence was recorded by counting the wilted plants at time of flowering and per cent infection was calculated by using the following formula:

$$\text{Percent Plant Infection (PPI)} = \frac{\text{Number of infected plants}}{\text{Number of plants observed}} \times 100$$

### Results and Discussion

The data presented in the above Table 1, is the results of the *in-vivo* test on the effect of botanical extracts and Modified Panchagavya (MPG) along with carbendazim (as check) on the *Fusarium* wilt incidence of Chilli cv. Jiri. Data revealed that among the different indigenous botanical extracts and natural products (MPG), garlic has yielded the best results with minimum wilt incidence of 30.00% followed by darrek (36.66%), modified panchagavya (43.33%), wild sage (46.66%) and nongmangkha (46.66%) as compared to 73.33 per cent in untreated control. However, Carbendazim used as check was found 23.33 per cent of wilt as compared to untreated control.

It is obvious from the above experimental results that during *in-vivo* trial among different indigenous botanical extracts and natural products MPG most effective treatment in reducing the wilt incidence was found in Garlic followed by Darrek, Modified Panchagavya (MPG), Wild sage, Nongmangkha and Ginger in respective descending order. Our present finding was in corroborated with that of Sinha (2004) [7] reported that among the botanical neem leaf extract (5%) reduced the wilt disease complex of Lentil to 2.5% and Garlic bulb extract (5%) enhanced to 3.1% incidence. Raut and Patil (2005) [8] confirmed from the field trial that among the different treatments 1% Bordeaux



**Figure 2:** (A) *Fusarium* wilt chilli plant at flowering stage, (B) Death of *Fusarium* wilt affected chilli plant during advance stage of diseased, (C) Cross section showing *Fusarium* wilt chilli plant, showing brown discolouration of vascular tissue in the stem and root.

**Table 1:** Effect of botanical extracts and Modified Panchagavya (MPG) on wilt incidence of Chilli cv. Jiri.

S. No.	Treatments (T)	Concentration (C)	Mean percent infection*
1.	Wild sage ( <i>Lantana camara</i> )	5%	46.66 (6.86)
2.	Darrek ( <i>Melia azedirach</i> )	15%	36.66 (6.09)
3.	Nongmangkha ( <i>Phlogacanthus thyrsoiflorus</i> )	10%	46.66 (6.86)
4.	Ginger ( <i>Zingiber officinale</i> )	15%	53.33 (7.33)
5.	Garlic ( <i>Allium sativum</i> )	10%	30.00 (5.51)
6.	MPG (Modified Panchagavya)	15%	43.33 (6.61)
7.	Carbendazim (0.1% as check)	0.1%	23.33 (4.87)
8.	Control	-	73.33 (8.58)

SE  $\pm$  d - 0.11, C.D - 0.23, \*Observations taken at the time of flowering

mixer and 0.1% Bavistin were the best control treatment of *Fusarium* wilt of tomato and their growth inhibition percentages were 72.57% and 71.42% respectively. Raju (2005) [9] reported that among the different bioagents and fungicides treatments viz., *T. viride* (4 g/kg) Carbendazim (0.1%), and Rhizobium (2 g/kg seed) and Carbendazim recorded minimum *Fusarium* wilt incidence of Pigeon pea (15%) (Figure 3).

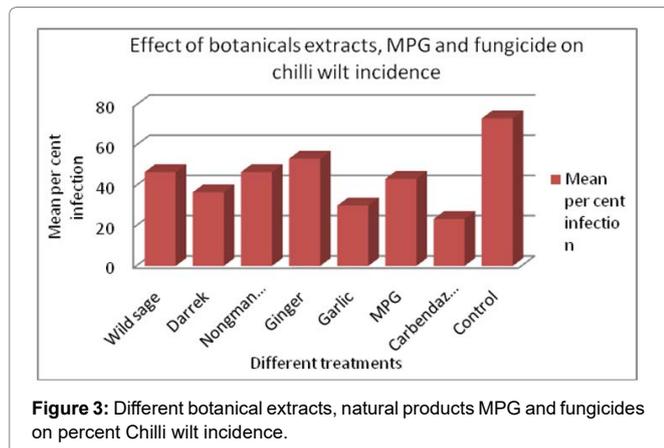


Figure 3: Different botanical extracts, natural products MPG and fungicides on percent Chilli wilt incidence.

In our present study Modified Panchagavya (MPG) was found to be fourth effective in controlling the *Fusarium* wilt of Chilli. Reddy (1996) [4] also reported that MPG (20.30 PDI) was superior to Carbendazim (34.40 PDI) in reducing the plant disease index of *Fusarium* wilt of tomato and increasing the vigour of tomato plant and yield. They also found high microbial activity and low pathogen population (*Fusarium oxysporum* f. *Sp. lycopersici*) in the soil treated with MPG.

Differences in the effectiveness of different botanical extracts on the management of *Fusarium* wilt of Chilli in our present investigation might be due to variation in concentration and composition of antifungal compounds in different plants [10] or might be due to the presence of oil in plants parts [11] or might have high microbial activity and low pathogen population in the soil treated with MPG by suppressing the pathogen and thereby increasing the vigour or resistance of plant part or suppression of pathogen could have occurred by encouraging the local antagonists of the pathogen [4].

## Conclusion

Our present investigation revealed the potential of various botanicals extracts and natural products (MPG) for the management of *Fusarium* wilt disease of Chilli besides chemical fungicides. However, there is need for further in depth research to understand the depth of active components produced in the plants and MPG mixture and their mechanism of action. It is also necessary to develop and test various formulations of botanical extracts and natural products obtained from the cow and other livestock to work out for effective management of various diseases.

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