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In vitro evaluation of organic inputs against cumin wilt causing *Fusarium oxysporum* f. sp. *cumini*

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Abstract
An experiment was conducted to determine the effect of different organic inputs on radial colony growth of *Fusarium oxysporum* f. sp. *cumini*. The poisoned food technique in potato dextrose agar medium was used at various concentrations *in vitro*. Six organic inputs were evaluated against *F. oxysporum* f. sp. *cumini* using poisoned food technique *in vitro* at three different concentrations 5, 10 and 15 per cent. Among organic inputs, Panchagavya was found effective against *F. oxysporum* f. sp. *cumini* and resulted that no growth of mycelial and cent per cent inhibition of *F. oxysporum* f. sp. *cumini* at 5, 10 and 15 per cent concentration.

Keywords: *F. oxysporum* f. sp. *cumini, in vitro,* management, organic inputs

Introduction
Cumin (*Cuminum cyminum* Linn.) is an important seed spice crop. It belongs to the family *Apiaceae* or *Umbelliferae* and is native of the Mediterranean and Near Eastern regions. In India, it is cultivated in the area of 1302336 ha with production of 894565 MT and productivity is 686 kg/ha (Anonymous, 2024) [1]. In Gujarat, it is cultivated in the area of 5613 ha with production of 4183 MT and productivity is 745 kg/ha (Anonymous, 2024) [1]. Cumin is a important *rabi* crop in the parts of Saurashtra and North Gujarat and affected mainly with three important fungal diseases *viz*., blight (*Alternaria burnsii*), wilt (*Fusarium oxysporum* f. sp. *cumini*) and powdery mildew (*Erysiphe polygoni*). Among them, wilt caused by *F. oxysporum* f. sp. *cumini* is a destructive disease and resulted in yield losses of up to 80 per cent (Sastry and Anandaraj, 2013) [15].
The fungus is characterized by white mycelium and abundant in culture. Microconidia of this fungus are small, one to two celled, hyaline with oval to reniform or oval to oblong with slightly curved shape with length and width ranged from 3.48-17.38 µm and 2.30-4.55 µm, respectively. Macroconidia in all these isolates were long, slightly curved or boat shaped, variable in size and smoothly rounded or pointed at the tip, with 2-5 septa, hyaline in colour with length and width ranged from 16.89 to 59.30 µm and 4.08 to 6.98 µm, respectively. Chlamydospores were thick walled, hyaline, varied in shape, produced intercalary and terminal, single and in pair or in chain (Nawade *et al*., 2017) [11]. The used of chemicals that is hazardous effects. This situation triggered interest in searching alternates for diseases control.
It is necessary to manage the disease by organic inputs *in vitro* condition which may provide new information for its management. In future, this information can be utilized for management of disease in the crop.

Materials and Methods
An *in vitro* experiment was conducted at the P. G. laboratory, Department of Plant Pathology, B. A. College of Agriculture, AAU, Anand. *In vitro* efficacy of organic inputs against the pathogen was evaluated by poisoned food technique (Nene and Thapliyal, 1993) [12].
Six organic inputs *viz*., cow dung, urine, buttermilk, milk, *Jeevamrutha* and *Panchagavya* were tested against *F. oxysporum* f. sp. *cumini*. Fresh cow urine, dung, milk were collected from Livestock Research Station, AAU, Anand from cow (*Desi* breed). Cow urine, milk and

buttermilk were filtered through whatman no.1 filter paper under aseptic condition. It was stored in airtight container at 4 ^{0}C before use. The filter was mixed with sterilized water to the final concentration *viz*., 5, 10 and 15 per cent. Sterilized PDA was used as a nutrient medium and required quantity of each organic input was added. Twenty ml poisoned medium was poured to each Petri plates and it was allowed to solidify. An actively growing mycelial bit of 5 mm diameter was transferred under aseptic conditions over the solidified PDA medium and then Petri plates were incubated at 28±2 ^{0}C and observations were recorded when control plates were fully covered by mycelium growth. Petri plates without organic input were kept as a control.

The completely randomized design with three repetitions was adopted. Observations were recorded when control plates were fully covered with mycelium. Mycelial growth of the fungus was measured by taking the diameter in two directions and the average was recorded.

The growth inhibition of pathogen over control was calculated using the formula given by Vincent (1947) [17].

$$I = \frac{C - T}{C} \times 100$$

Where,

I = Per cent inhibition of mycelial growth

C= Radial growth of fungus in control (mm)

T= Radial growth of fungus in treatment (mm)

Results and Discussion

In an approach toward the eco-friendly management, an attempt was made to evaluate the antifungal activity of organic inputs at different concentrations 5, 10 and 15 per cent against *F. oxysporum* f. sp. *cumini* by using poisoned food technique and the results are presented in Table 1. The results revealed that no growth of mycelial and cent per cent inhibition of *F. oxysporum* f. sp. *cumini* was observed in *Panchagavya* at 5, 10 and 15 per cent concentrations. It was remained significantly superior in growth inhibition then rest of organic inputs. Next best organic input, cow dung was found 79.00, 83.52 and 88.43 per cent inhibition of mycelial growth with 18.83, 14.67 and 10.33 mm colony diameter of *F. oxysporum* f. sp. *cumini* at 5, 10 and 15 per cent concentrations, respectively. The cow urine, butter milk and *Jeevamrutha* were found also effective the inhibited mycelial growth of *F. oxysporum* f. sp. *cumini* with 59.30, 56.14 and 67.10 at 5 per cent, 59.74, 59.36 and 69.85 at 10 per cent concentration, 62.50, 61.75 and 74.63 at 15 per cent concentration, respectively. Cow milk was found least effective against *F. oxysporum*.

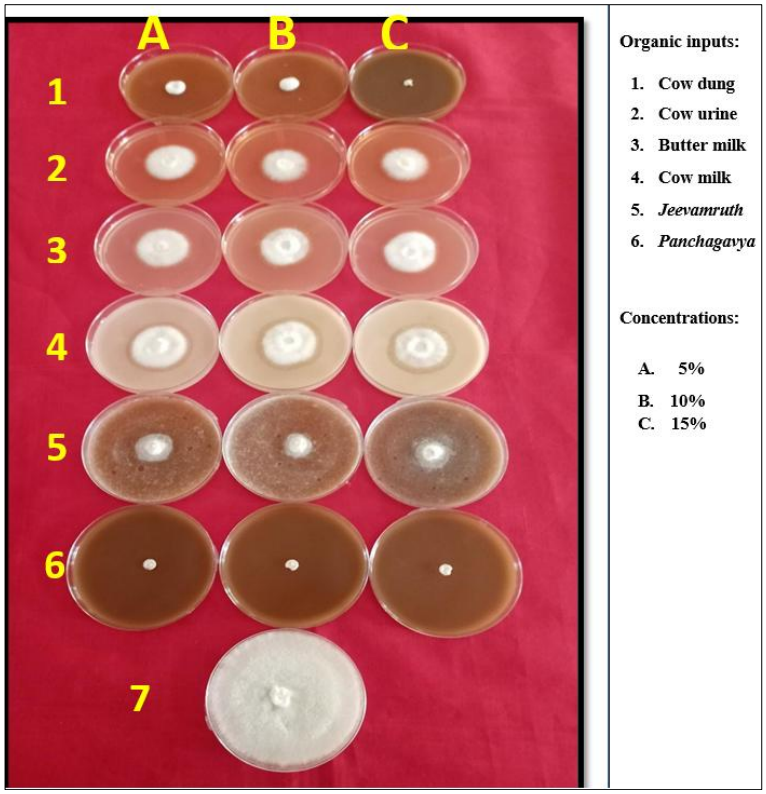
This results were confirmed by Rana *et al*. (2020) [14] evaluated different organic formulations *likes* cow urine, *Beejamrutha*, *Panchgavya*, tamarlassi, vermiwash and biosol against *Fusarium* wilt of chickpea caused by *Fusarium oxysporum* f. sp. *ciceris* under *in vitro* conditions and resulted that *Panchgavya* showed maximum mycelial inhibition of 92.22%.

Table 1: *In vitro* evaluation of organic inputs against cumin wilt

Tr. No.	Treatments	Mycelial growth of pathogen (mm)@			Growth inhibition (%)		
		5 per cent	10 per cent	15 per cent	5 per cent	10 per cent	15 per cent
T_1	Cow dung	18.83^e	14.67^e	10.33^e	79.00	83.52	88.43
T_2	Cow urine	36.50^c	35.83^c	33.50^c	59.30	59.74	62.50
T_3	Butter milk	39.33^c	36.17^c	34.17^c	56.14	59.36	61.75
T_4	Cow milk	42.83^b	39.50^b	38.83^b	52.23	55.62	56.53
T_5	*Jeevamrutha*	29.50^d	26.83^d	22.67^d	67.10	69.85	74.63
T_6	*Panchagavya*	00.00^f	00.00^f	00.00^f	100.00	100.00	100.00
T_7	Control (Test pathogen only)	89.67^a	89.00^a	89.33^a	-	-	-
S. Em±		0.91	0.63	0.60	-	-	-
C.D. at 5%		Sig.	Sig.	Sig.	-	-	-
C.V.%		4.32	3.16	3.20	-	-	-

@Mean of three repetitions

Note: Treatment means with the letter/letters in common are not significant by Duncan's new multiple range test (DNMRT) at 5% level of significance



Graph 1: Growth inhibition of *F. oxysporum* on PDA supplement with different organic inputs

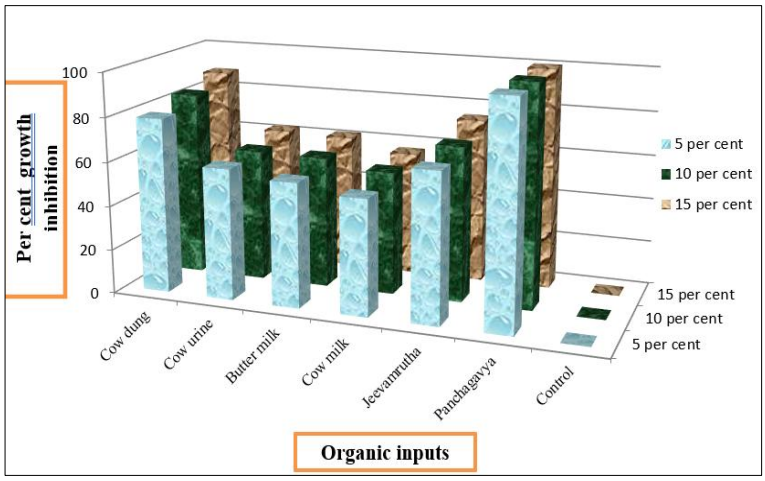


Fig 1: Per cent Growth inhibition of *F. oxysporum* with different organic inputs

Conclusion

Organic inputs have an excellent germicidal power, antibiotics and antimicrobial activity. Among six organic inputs, *Panchagavya* was found effective against *F. oxysporum* f. sp. *cumini* and resulted that no growth of mycelial and cent per cent inhibition of *F. oxysporum* f. sp. *cumini* at 5, 10 and 15 per cent concentration.

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