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## *In vitro* evaluation of phytoextracts against *Colletotrichum capsici* caused anthracnose disease of yam (*Dioscorea alata* L.)

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**Abstract**

An experiment was conducted at the Plant Pathology Laboratory, department of Plant Pathology, N.M. College of Agriculture, Navsari Agricultural University, Navsari. Phytoextracts of nine plant species were evaluated *in vitro* for their bio efficacy against *C. capsici*. All the phytoextracts were found effective in inhibiting the growth. Among them, extract of neem (*Azadirachta indica* L.) (73.75%) was proved excellent in inhibiting mycelial growth of the pathogen. Next best in order of merit was marigold (*Tegetes erecta* L.) (70.42%), Ginger (*Zingiber officinalis* Rosa.) (67.08%), turmeric (*Curcuma longa* L.) (62.92%), babul (*Vachellia nilotica* L.) (60.42%) and tulsi (*Ocimum sanctum* L.) (52.08%).

**Keywords:** *In vitro*, phytoextracts, *Colletotrichum capsici*, anthracnose, *Dioscorea alata*

**Introduction**

The yam is a common name for some species in the genus *Dioscorea* (family: Dioscoraceae). These perennial vines are cultivated for consumption of starchy tubers in Africa, Asia, Latin America and Oceania. Yam is considered to be originated from the Indo-Burmese region of South East Asia and consisted of about 600 species which are mostly tropical in distribution (Thamburaj and Singh, 2005) [9]. Yam with average world productivity of 9.2 t ha<sup>-1</sup> are cultivated globally in 4.4 million hectare's, with production of 40 million tonnes, while in India, the crop covers 30,000 ha area with 80,000 MT (0.8 million) production and has an average productivity of 28 t ha<sup>-1</sup> (Abraham *et al.* 2006) [11]. The major yam producing states in India includes Gujarat, Maharashtra, Orissa, Rajasthan, Kerala, West Bengal, Bihar and Assam. Two Asiatic yams, *viz.* *Dioscorea alata* Linn (greater yam) and *Dioscorea esculenta* (Lour.) Murkill (lesser yam) are the major food of the Indians. The yams exploited for pharmaceutical purposes are non-edible, (Thamburaj and Singh, 2005) [9]. Yams form staple diet in many parts of Western Africa. The processing and consumption are still by conventional methods. The conventional processing techniques are boiling, roasting, frying or conversion to fufu. Fufu (a cooked and mashed yam tuber) is an important product made from yam in Western and Central Africa. Wafers, crepes and biscuits made out of yam tubers were found to have good acceptability. Traditionally in many Indian families yam tubers are consumed after cooking and peeling. Yam are a valuable source of carbohydrate to the people of the tropical and subtropical Africa, Central and South America, parts of Asia, the Caribbean and Pacific Islands (Coursey, 1967; Adelus and Lawanson, 1987) [3, 2]. *D. alata* tubers are peeled and cooked or used as vegetable. The 100 g edible portion of yams contains 8 mg calcium, 28 mg Phosphorous, 1.1 mg Iron, 5 mg Vitamin A, 0.10 mg Thiamine, 0.04 mg Riboflavin, 0.5 mg Niacin and 6 mg Ascorbic acid (Tindall, 1983) [10]. Many fungal and viral diseases have been observed in edible yams at various stages of growth and production. Among the fungal diseases, anthracnose, (*Colletotrichum gloeosporioides* Penz. and Sacc.), Cercospora leaf spot, Curvularia leaf spot (*Curvularia eragrostides* (Henn.) Meyer), leaf blight (*Pestalotia* sp.) and dry rot (*Botryodiplodia theobromae* Pat., *Penicillium oxalicum* Currie and Thom, *Penicillium italicum* Wehmer), soft rot (*Rhizopus nigricans* Ehr., *Sclerotium rolfii* Sacc.) and bacterial disease *viz.*, wet rot (*Erwinia caratovora* sub. sp. *caratovora* Jones) in storage are important ones. In case of viral disease, yam mosaic disease is reported. This disease is caused by an aphid-transmitted potyvirus that infects several species of *Dioscorea*, particularly *D. alata* L., *D. cayenensis* Lam, *D. rotundata* Poir and *D. trifida* L. (Mantell, 1980; IITA, 1993) [6, 4]. The anthracnose of yam is caused by *Colletotrichum gloeosporioides* Penz. and Sacc. was first reported in Rajasthan in devastating form and caused 70-80 per cent loss in yield under favourable climatic conditions. This disease is now widespread in India and occurs every year on all *Dioscorea* spp. but in severe form only in *D. alata*.

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The initial symptoms appeared as brown pin-head like spots on the leaves and in advanced stages leaves and stems are completely blighted and dried up (Thamburaj and Singh, 2005) [9]. The anthracnose disease was observed in severe form on the horticultural farm of the Navsari Agricultural University, Navsari, in the year 2007 on the *Dioscorea alata* and *Colletotrichum capsici* (Syd.) Butler and Bisby was observed to be constantly associated with the disease (Mehetre, 2009) [7]. Since then the disease was found in moderate form. Again this disease was found in October, 2015. So, the problem was undertaken to generate scientific information and for finding the recent management measures.

### Materials and Method

The experiment was conducted during 2017-18 at Plant Pathology Laboratory, Department of Plant Pathology, N. M. College of Agriculture, Navsari Agricultural University, Navsari. The plant extracts at 10 per cent concentration of various nine plants species viz. Bougainvillea (*Bougainvillea spectabilis* L.) Ginger (*Zingiber officinalis* Rosa.) Datura (*Datura stramonium* L.) Turmeric (*Curcuma longa* L.) Tulsi (*Ocimum sanctum* L.) Jasud (*Hibiscus bombycideron* L.) Marigold (*Tegetes erecta* L.) Neem (*Azadirachta indica* L.) Babul (*Vachellia nilotica* L.) were tested *in vitro* by using 'Poisoned food technique' to know their inhibitory effect on the growth of *Colletotrichum capsici*. Fresh healthy plant parts i.e. leaves, bulb, finger parts as listed in Table 3 were collected, washed thoroughly with tap water and finally rinsed with sterile distilled water. Fifty grams of leaves, bulbs and finger parts were mixed with the help of grinder by adding 50 ml distilled water. The extracts were filtered through double layered sterile muslin cloth and collected in 150 ml conical flasks and plugged with non-absorbent cotton. Thus, filtered phytoextracts were autoclaved at 1.2 kg cm<sup>-2</sup> pressure for 20 minutes prior to their use in poisoned food technique. Autoclaved extracts were individually added in previously sterilized PDA at 10 per cent (2 ml extract + 18 ml PDA) at the time of pouring in plates and mixed thoroughly at the time of pouring in the previously sterilized Petri plates. All the plates containing phytoextracts were inoculated aseptically after solidification by placing a mycelial disc of 5 mm diameter of vigorously growing 7 days old pure culture of *Colletotrichum capsici* and incubated at temperature (28±2°C) for 7 days. Three repetitions of each treatment were maintained and the plates without phytoextracts remained as control. Radial growth of the causal organism was recorded and Per cent growth inhibition was calculated by formula given by Vincent (1947) [11]:

$$\text{Growth inhibition (\%)} = \frac{C - T \times 100}{C}$$

### Where

C = Growth of pathogen in control after incubation

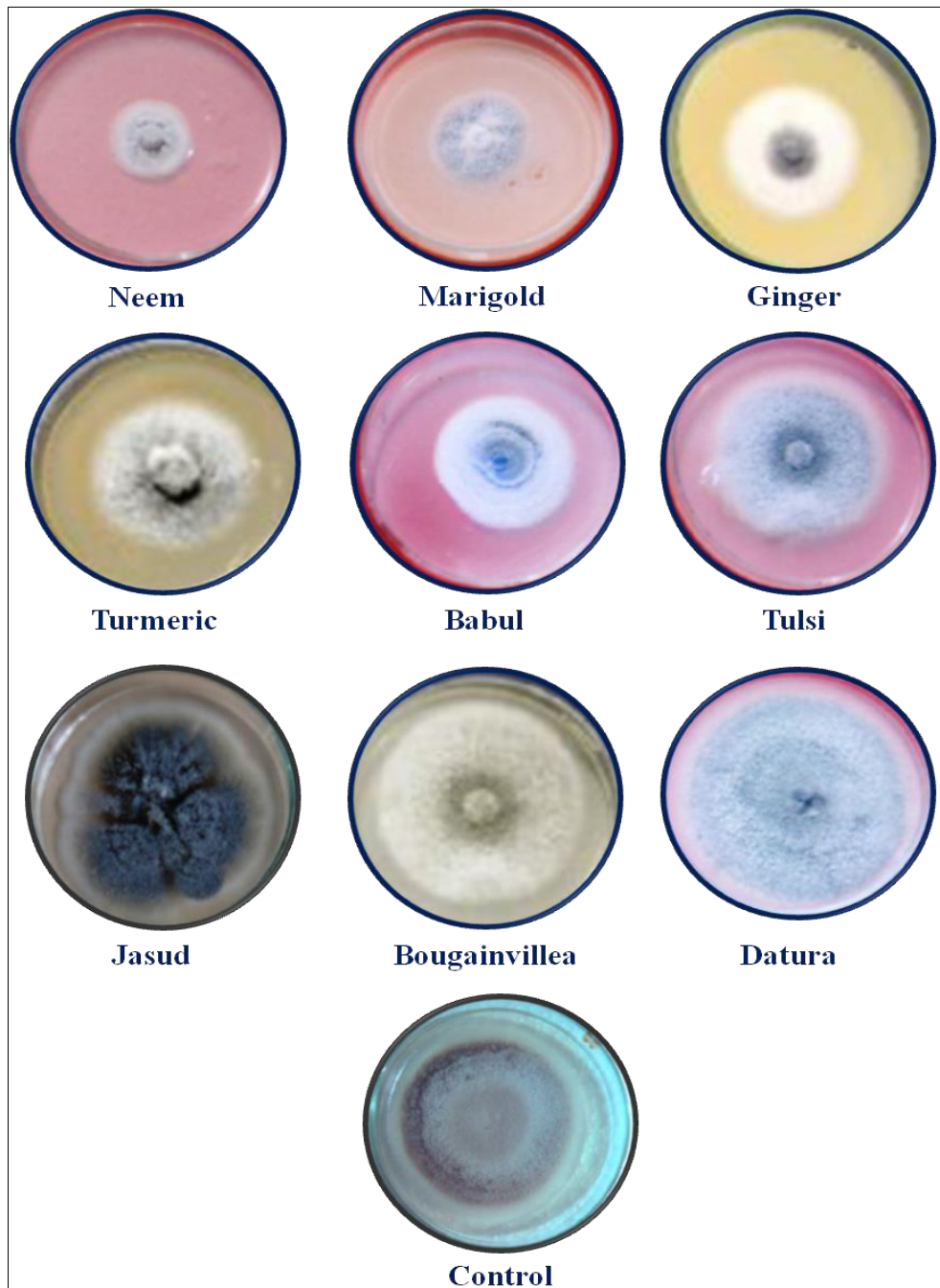
T = Growth of pathogen in treatment after incubation

### Results and Discussion

The results presented in Table-1 showed that all the nine phytoextracts tested were found effective and significantly inhibited growth of the fungus over control. Among the effective phytoextracts, the lowest mycelial growth of *C. capsici* was observed in leaf extract of neem (21.00 mm) which was at par with leaf extract of marigold (23.67 mm) and these were significantly superior in its efficacy over the rest. Next best in order of merit was rhizome extract of ginger (26.33 mm) which was at par with rhizome extract of turmeric (29.67 mm). The leaf extract of babul (31.67 mm), tulsi leaf extract (38.33 mm) and leaf extract of *Hibiscus* sp. (45.67 mm) were also found good in their efficacy. Whereas, leaf extracts of bougainvillea (50.67 mm) and datura (61.33 mm) were found comparatively less effective. The leaf extract of neem produced maximum mycelial growth inhibition (73.75%) which was found superior over other extracts. Next best in order of merit was leaf extract of marigold (70.40%), rhizome extract of ginger (67.08%), rhizome extract of turmeric (62.92%), leaf extract of babul (60.42%) and tulsi leaf extract (52.08%). While leaf extract of jasud (42.92%) bougainvillea (36.67%) and datura (23.33%) were proved least effective in inhibiting growth of the pathogen. Thus, extract of neem and marigold proved most effective in inhibiting mycelial growth of the pathogen. Ginger, turmeric, babul and tulsi were also found moderately effective against *C. Capsici*. While leaf extract of jasud, bougainvillea and datura were proved least effective in inhibiting growth of the pathogen. From this experiment, it is evident that extracts of neem (*Azadirachta indica* L.), marigold (*Tegetes erecta* L.), Ginger (*Zingiber officinalis* Rosa.), turmeric (*Curcuma longa* L.), babul (*Vacgellia nilotica* L.) and tulsi (*Ocimum sanctum* L.) have some toxic property which directly affects growth of the pathogen. Shivpuri *et al.* (1997) observed that leaf extract of *A. indica*, *D. stramonium*, *O. sanctum*, *P. logifolia* and *V. rosea* were more fungitoxic at 1000 ppm against *C. capsici*, *A. brassicola*, *F. oxysporum*, *R. solani* and *S. sclerotiorum*. Kumar and Yadav (2007) [5] found that among three phytoextracts, *Azadirachta indica* and *Allium sativum* at 4 per cent were found effective in inhibiting the mycelial growth and conidial germination of *C. gloeosporioides* and *C. capsici* inciting anthracnose disease in betelvine.

**Table 1:** Evaluation of various phytoextracts against *Colletotrichum capsici* *in vitro*

Sr. No.	Local name	Botanical name	Plant parts used for preparation of extracts	Colony diameter (mm)	Per cent growth inhibition over control
1.	Bougainvillea	<i>Bougainvillea spectabilis</i>	Leaves	50.67	36.67
2.	Ginger	<i>Zingiber officinalis</i> Rosa.	Rhizome	26.33	67.08
3.	Datura	<i>Datura stramonium</i> L.	Leaves	61.33	23.33
4.	Turmeric	<i>Curcuma longa</i> L.	Rhizome	29.67	62.92
5.	Tulsi	<i>Ocimum sanctum</i> L.	Leaves	38.33	52.08
6.	Jasud	<i>Hibiscus bombycideron</i>	Leaves	45.67	42.92
7.	Marigold	<i>Teget eserecta</i>	Leaves	23.67	70.42
8.	Neem	<i>Azadirachta indica</i>	Leaves	21.00	73.75
9.	Babul	<i>Vacgellia nilotica</i>	Leaves	31.67	60.42
10.	Control			80.00	0.00
	S.Em.±			1.23	
	C.D. at 5%			3.64	
	C.V.%			5.24	



**Plate 1:** Evaluation of phytoextracts against *Colletotrichum capsici*

### References

1. Abraham K, Edison S, Unnikrishnan M, Sheela MN, Vimla B, Sreekumari MT, *et al.* Tuber crops varieties. Central Tuber Crop Research Institute. Technical Bulletin Series. 2006; 24:41-42.
2. Adelusi AA, Lawanson AO. Disease induced changes in Carotenoid content of edible yam (*Dioscorea* spp.) infected by *Botryodiplodia theobromae* and *Aspergillus niger*. Mycopathology. 1987; 98:49-58.
3. Coursey DG. Yam Storage I. A review of storage practices and information on storage losses. Journal of Stored Production Research. 1967; 2:227-244.
4. IITA. Crop Improvement division/Tuber toor Improvrment Program Archival Reports (1989-1993). Part III yam, *Dioscorea* spp. Ibadan, Nigeria, 1993, 20-85.
5. Kumar S, Yadav BP. Efficacy of fungicides and phytoexyracts on *Colletotrichum* spp. Journal of Mycology and Plant Pathology. 2007; 37(2):363-364.
6. Mantell SH. Apical meristem-tip culture for eradication of flexuous rod viruses in yam (*Dioscorea alata*). Tropical Pest Management. 1980; 26:170-179.
7. Mehetre PB. Investigation on anthracnose of yam (*Dioscorea alata* L.) caused by *Colletotrichum capsici* (Syd.) Butler and Bisby under South Gujarat condition. M.Sc. (Horti.), thesis submitted at Navsari Agricultural University, Navsari (unpublished), 2009.
8. Shivpuri A, Sharma OP, Jhamaria SL. Fungitoxic properties of plant extracts against pathogenic fungi. Indian Journal of Mycology and Plant Pathology. 1997; 27(1):29-31.
9. Thamburaj S, Singh N. Vegetables, tubercrops and spices. ICAR, New Delhi, 2005, 415-426.
10. Tindall HD. Vegetables in the tropics 1983; 52:100-104.
11. Vincent JM. Distortion of fungal hyphae in presence of certain inhibitors. Nature. 1947; 150:850.