Inhibitory Effect of Cow Urine against *Colletotrichum capsici* Isolated from Anthracnose of Chilli (*Capsicum annuum* L.)

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**Abstract**

Cow urine has got several applications in agriculture. It is shown to possess inhibitory activity against many phytopathogenic fungi and bacteria. Among various diseases of Chilli, anthracnose is the most important disease which results in drastic reduction in yield. The present study was conducted with an aim to determine antifungal efficacy of cow urine against *Colletotrichum capsici* isolated from anthracnose of chilli (*Capsicum annuum* L.). Poisoned food technique was employed to determine antifungal activity of different concentrations of cow urine (5, 10 and 15%). Cow urine was found to display concentration dependent inhibitory activity against fungal growth. An inhibition of >50% was observed at 5% concentration. In conclusion, the use of cow urine can be the cost-effective and eco-friendly approach for controlling anthracnose in chilli.

**Keywords:** Cow urine, Anthracnose, *Colletotrichum capsici*, Poisonous food technique

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**INTRODUCTION**

Chilli, belonging to the genus *Capsicum* (Solanaceae) is an herbaceous, annual, dicotyledonous flowering plant and is an important crop grown worldwide in tropical and subtropical regions. It is grown extensively for its consumption, nutritional and economy purposes. It is used as spice (ripe and dried form) and vegetable (green fruit). India is known to be the largest producer of chilli in terms of production.

Chilli is known to contain a number of chemicals viz., steam-volatile oils, fatty oils, capsaicinoids, carotenoids, vitamins, protein, fibre and mineral elements. The production of chilli is influenced by various factors. The chilli cultivars are susceptible to various diseases caused by fungi, bacteria and viruses which account for marked reduction in productivity.

Among various diseases, anthracnose (both pre-harvest and post-harvest) is the most important disease which results in drastic reduction in yield, deterioration of the quality of fruit. The typical anthracnose symptoms on chilli fruit include sunken necrotic tissues with concentric rings of acervuli. Anthracnose disease of chilli is reported to be caused by a number of *Colletotrichum* species such as *C. capsici*, *C. acutatum*, *C. gloeosporioides*, *C. coccodes* and *C. dematium*. The anthracnose may result in yield loss up to 50%. Among the species of *Colletotrichum*, *C. capsici* is the most important pathogen implicated in causing anthracnose (Ushakiran et al., 2006; Anand et al., 2007; Ratanacherchodhai et al., 2007; Than et al., 2008; Kim et al., 2010; Narasimhan and Shivakumar, 2012; Susheela, 2012; Masoodi et al., 2013).

Cow is believed to be a sacred animal in India. The urine of cow is used for several medicinal purposes since ancient time. The description on the use of cow urine has been mentioned in classical Ayurveda texts such as Charakasamhita and Shushrutasamhita. The urine of cow is compared with the nectar in Veda. Cow urine is known to cause weight loss, and reverse certain cardiac and kidney problems, indigestion, stomach ache and edema. It is suggested that cow urine is also useful in treating renal colic, jaundice, anemia, diarrhoea, gastric infections, piles and skin diseases. It is also considered as an appetizer and is known to reverse inflammation, or a diuretic as well as a nephroprotective agent. Experiments have shown that cow urine has several biological activities such as antimicrobial, anti-diabetic, antioxidant, anti-tumor, molluscidal and others (Krishnamurthi et al., 2004; Gururaja et al., 2011; Rakesh et al., 2013a). Cow urine has got several applications in agriculture. Cow urine is shown to control root knot nematode in tomato and melon aphids and pickle worms in watermelon cultivation.
Yashoda Kambar et al.,

(Abubakar et al., 2004; Burubai and Eribo, 2012). Cow urine, cow urine extracts of plants and cow urine in combination with plants were found to exhibit inhibitory activity against phytopathogenic fungi and bacteria (Basak et al., 2002a; Basak et al., 2002b; Akhter et al., 2006; Murugan et al., 2012; Rakesh et al., 2013a; Rakesh et al., 2013b). In the present study, we have determined the effect of different concentrations of cow urine against C. capsici isolated from anthracnose of Chilli (Capsicum annuum L.).

MATERIALS AND METHODS

Isolation of Colletotrichum capsici

The test fungus C. capsici was isolated from anthracnose of chilli by cutting and placing the affected fruit part on potato dextrose agar (PDA). The fungus was identified based on morphology and microscopic features (Barnett and Hunter, 1998; Shenoy et al., 2007). The fungus produced dense whitish to dark grey aerial mycelium, reverse dark, conidial mass pale buff to salmon. Sclerotia absent, setae were abundant. Conidia are falcate, fusiform, with acute apices. Appressoria are abundant, medium brown and clavate to circular. The isolate was maintained in refrigerator on PDA slants.

Cow Urine

Urine of an indigenous cow variety called Malnad gidda was collected at early morning in a sterile container. The urine was filtered through Whatman No. 1, stored in airtight container and used for antifungal study (Rakesh et al., 2013b).

Antifungal Activity of Cow Urine against C. capsici

In order to evaluate inhibitory potential of cow urine, Poisoned food technique was employed. Here, petriplates containing PDA medium amended with different concentrations of cow urine viz., 5%, 10% and 15% were inoculated at the centre with the 5mm fungal discs (cut from the periphery of 5 days old test fungus). The plates were incubated at 28°C for 5 days. Colony diameters were measured in mutual perpendicular directions on 5th day. Antifungal effect of cow urine was recorded in terms of inhibition of mycelial growth (%) and was calculated using the formula:

\[
\text{Inhibition of mycelia growth} = \left( \frac{C - T}{C} \right) \times 100
\]

where C is average diameter of fungal colony in control plates and T is the average diameter of fungal colony in poisoned plates (Rakesh et al., 2013a).

RESULTS AND DISCUSSION

The result of antifungal effect of cow urine against C. capsici is presented in Table 1 and Figure 1. Cow urine was found to exhibit concentration dependent inhibition of test fungus. The colony diameter of test fungus drastically reduced in PDA plates poisoned with cow urine. An inhibition of >50% was observed at 5% concentration and >75% inhibition was observed at cow urine concentration 10 and 15%.

One of the widely used strategies for controlling anthracnose causing fungi is the use of chemical approach. However, the use of chemicals has some ill-effects such as toxicity, development of resistant fungal strains and environmental pollution. Hence, various approaches have been tried to find alternatives for the chemical agents. Inoculation of chilli plants with bacteria such as Pseudomonas fluorescens (Anand et al., 2007) and Burkholderia sp. strain TNAU-1 (Madhavan et al., 2011) resulted in induction of systemic resistance. It has been found that the plant extracts (Ushakiran et al., 2006; Tiwari et al., 2008; Aderonke et al., 2011) and biocontrol agents such as Trichoderma harzianum, Trichoderma viridae, Pseudomonas fluorescens, Bacillus species (Ekbote, 2005; Ushakiran et al., 2006; Tiwari et al., 2008; Narasimhan and Shivakumar, 2012) have shown to be effective against the Colletotrichum species isolated from anthracnose of chilli.

Table 1: Radial growth and percentage inhibition of C. capsici in plates poisoned with different concentrations of cow urine.

| Concentration (%) | Colony diameter (cm) | Inhibition (%) |
|-------------------|----------------------|---------------|
| 0 (control)       | 3.45±0.05            | 0.0           |
| 5                 | 1.50±0.00            | 56.5          |
| 10                | 0.85±0.05            | 75.4          |
| 15                | 0.70±0.00            | 79.7          |

Figure 1: Radial growth of C. capsici in plates poisoned with different concentrations of cow urine.

Cow urine has shown to be promising against phytopathogenic fungi and bacteria. Studies on Cow urine alone/combination of cow urine with plants showed inhibition of Sclerotinia sclerotiorum causing Sclerotinia rot in cucumber (Basak et al., 2002a), Fusarium solani f.sp. cucurbitae causing root rot disease of cucumber (Basak et al., 2002b). Bipolaris sorokiniana causing leaf blight of wheat (Akhter et al., 2006), Xanthomonas oryzae pv. oryzae causing leaf blight of paddy (Murugan et al., 2012) and Fusarium oxysporum f.sp. zingiberi,Ralstonia solanacearum and Pythium aphanidermatum causing rhizome rot of ginger (Rakesh et al., 2013a; Rakesh et al., 2013b). In our study, cow urine has shown to exhibit marked inhibition of C. capsici isolated from anthracnose lesions on chilli. The inhibitory activity was concentration dependent i.e., with increase in the concentration, inhibition was also increased. In an earlier study, Rakesh et al. (2013b) showed similar concentration dependent
inhibitory activity of cow urine against *Fusarium oxysporum* f. sp. *zingiberi* isolated from rhizome rot specimen of ginger.

**CONCLUSION**

Cow urine has shown marked concentration dependent inhibition of *C. capsici* in this study. The use of cow urine can be the cost-effective and eco-friendly approach for controlling anthracnose in chilli.

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**REFERENCES**

Abubakar, U., Adamu, T., Manga, S.B. (2004). Control of *Meloidogyne incognita* (kofoid and white) chitwood (root-knot nematode) of *Lycopersicon esculentum* (tomato) using cow dung and urine. African Journal of Biotechnology 3(8): 379-381.

Aderonke, A.E., Sikeola, A.O., Omolara, F. (2011). Evaluation of spices extracts for antifungal properties. Archives of Applied Science Research 3(5): 486-490.

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**REFERENCES**

Abubakar, U., Adamu, T., Manga, S.B. (2004). Control of *Meloidogyne incognita* (kofoid and white) chitwood (root-knot nematode) of *Lycopersicon esculentum* (tomato) using cow dung and urine. African Journal of Biotechnology 3(8): 379-381.

Aderonke, A.E., Sikeola, A.O., Omolara, F. (2011). Evaluation of spices extracts for antifungal properties. Archives of Applied Science Research 3(5): 486-490.

Akhter, N., Begum, M.F., Alam, S., Alam, M.S. (2006). Inhibitory effect of different plant extracts, cow dung and cow urine on conidial germination of *Bipolaris sorokiniana*. Journal of Bio-Science 2006; 14: 87-92.

Anand, T., Raguchander, T., Karkhikeyan, G., Gopalakrishnan, C., Bhaskaran, R., Ganeshamoorthi, P. (2007). Induction of systemic resistance by plant grown promoting rhizobacteria in chilli plants against fruit rot disease. World Journal of Agricultural Sciences 3(6): 824.

Barnett, H.L., Hunter, B.B. (1998). Illustrated Genera of Imperfect Fungi, 4th Edition, APS Press, Minnesota.

Basak, A.B., Lee, M.W., Lee, T.S. (2002a). Inhibitive activity of cow urine and cow dung against *Sclerotinia sclerotiorum* of Cucumber. Mycologyology 30(3): 175-179.

Basak, A.B., Lee, M.W., Lee, T.S. (2002b). In *vitro* inhibitory activity of cow urine and dung to *Fusarium solani* f.sp. *cucurbitae*. Mycologyology 30(1): 51-54.

Burubai, W., Eribo, M. (2012). Influence of incubation periods and dosage on the bioefficacy of cow urine against melon aphids (*Aphis gossypii*) and pickleworms (*Diaphania hyalinata*) in watermelon cultivation. Research Journal of Applied Sciences, Engineering and Technology 4(4): 269-272.

Ekbote, S.D. (2005). Effect of *Pseudomonas fluorescens* on anthracnose of Chili caused by *Colletotrichum capsici*. Karnataka Journal of Agricultural Sciences 18(1):162-165.

Gururaja, M. P., Joshi, A. B., Joshi, H., Sathyarayana, D., Subrahmanyam, E.V.S., Chandrasekhar, K.S. (2011). Antidiabetic potential of cow urine in streptozotocin-induced diabetic rats. Asian Journal of Traditional Medicines 6(1): 8-13.

Kim, J., Jee, H., Gwag, J., Kim, C., Chim, C. (2010). Evaluation on red pepper germplasm lines (*Capsicum* spp.) for resistance to anthracnose caused by *Colletotrichum acutum*. Plant Pathology Journal 26(3); 273-279.

Krishnamurthi K., Dutta, D., Sivanesan, S. D., and Chakrabarti, T. (2004). Protective effect of distillate and redistillate of cow’s urine in human polymorphonuclear leukocytes challenged with established genotoxic chemicals. Biomedical and Environmental Sciences 17: 247-256.

Madhavan, S., Paranidhanan, V., Velazhahan, (2011). Foliar application of *Burkholderia* sp. Strain TNAU-1 leads to activation of defense responses in chilli (*Capsicum annuum* L.). Brazilian Journal of Plant Physiology 23(4): 261-266.

Masoodi, L., Anwar, A., Ahmed, S., Sofi, T.A. (2013). Cultural, morphological and pathogenic variability in *Colletotrichum capsici* causing die-back and fruit rot in chilli. Asian Journal of Plant Pathology 7(1): 29-41.

Murugan, A.M., Shanthis, A., Arunachalam, C., Sivakumar, N., Elamathy, S., Rajapandian, K. (2012). Study on cow urine and *Pongamia pinnata* Linn seed in farmyard: A natural, cost effective, ecofriendly remedy to bacterial leaf blight (BLB) of paddy. African Journal of Biotechnology 11(40); 9591-9598.

Narasimhan, A., Shivakumar, S. (2012). Study of mycolytic enzymes of *Bacillus* sp. against *Colletotrichum gloeosporioides* causing anthracnose in Chilli. Acta Biologica Indica 1(1):81-89.

Rakesh, K.N., Dileep, N., Junaid, S., Kekuda, P.T.R., Vinayaka, K.S., Nawaz, N.A.S. (2013b). Inhibitory effect of cow urine extracts of selected plants against pathogens causing rhizome rot of ginger. Science Technology and Arts Research Journal 2(2): 92-96.

Rakesh, K.N., Dileep, N., Nawaz, N.A.S., Junaid, S., Kekuda, P.T.R. (2013a). Antifungal activity of cow urine against fungal pathogens causing rhizome rot of ginger. Environment and Ecology 31(3): 1241-1244.

Ratanacherdchai, K., Wang, H.K., Lin, F.C., Soyting, K. (2007). RAPD analysis of *Colletotrichum* species causing chilli anthracnose disease in Thailand. Journal of Agricultural Technology 3(2): 211-219.

Shenoy, B.D., Jeewon, R., Lam, W.H., Bhat, D.J., Than, P.P., Taylor, P.W.J., Hyde, K.D. (2007). Morpho-molecular characterization and epitypification of *Colletotrichum capsici* (*Gliomerella cingulata*, Sordariomycetes), the causative agent of anthracnose in chilli. Fungal Diversity 27: 197-211.

Susheela, K. (2012). Evaluation of screening methods for anthracnose disease in chilli. Pest Management in Horticultural Ecosystems 2012; 18(2): 188-193.

Than, P.P., Prihasutti, H., Phoulivong, S., Taylor, P.W.J., Hyde, K.D. (2008). Chilli anthracnose disease caused by *Colletotrichum* species. Journal of Zhejiang University Science B 9(10):764-778.

Tiware, P.K., Kasyap, A., Awadhiya, G.K., Thirmurty, V.S. (2008). Efficacy of bioagents, neem based plant products and plant extracts Against *Colletotrichum capsici*. Indian Journal of Plant Protection 36(1): 97.

Ushakiran, L., Chhetry, G.K.N., Singh, N.I. (2006). Fruit rot diseases of chilli and their management in agro-climatic conditions of Manipur. Journal of Mycopathological Research 44(2): 257-262.