International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(1): 878-881

Received: 21-11-2018
Accepted: 25-12-2018

Sandeep Kumar
Department of Plant Pathology, S. V. P. University of Agriculture & Technology, Meerut, Uttar Pradesh, India

VP Chaudhary
Department of Plant Pathology, N. D. University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

SP Pathak
Department of Plant Pathology, N. D. University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Krishna Kumar
Department of Plant Pathology, N. D. University of Agriculture & Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Correspondence
Sandeep Kumar
Department of Plant Pathology, S. V. P. University of Agriculture & Technology, Meerut, Uttar Pradesh, India

Integrated disease management approaches for stem gall disease of coriander incited by *P. macrosporus*

Sandeep Kumar, VP Chaudhary, SP Pathak and Krishna Kumar

Abstract
Coriander (*Coriandrum sativum* L.) is an important spices crop, grown in a wide range of weather conditions. Coriander suffers from various abiotic and biotic diseases. Among the biotic diseases, stem gall caused by *Protomyces macrosporus* is a major disease, which causes yield loss up to 33-36%. The experiments were conducted during 2016-17 at Vegetable Farm, Department of Vegetable Science, Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) with eleven treatments *viz.*, cow urine, cow dung slurry @ 10, 20 and 30% concentration of panchagavya, thiram @ 0.25%, carbendazim @ 0.2%, propiconazole @ 0.2% concentration and control. The effectiveness of organic treatments @ 30% concentration was significantly reducing the disease intensity. The maximum reduction was found 49.60% and 49.57% in panchagavya @ 30% concentration and minimum 17.61%, 26.88% in cow dung slurry @ 10% concentration during flowering and maturity stage respectively. In case of fungicides, the maximum disease control was recorded 51.70% at flowering stage and 49.71% at maturity stage treated with propiconazole @ 0.2% concentration. The maximum average numbers of chlamydospores were found at soil surface (198.80 g soil-1) and minimum in 2 inch depth (42.20 g soil-1) around the plant.

Keywords: integrated, stem gall, coriander, panchagavya and fungicide

Introduction
India is largest producer, consumer and exporter of coriander in the world. The foreign exchange earned through export of coriander is more than Rs. 40000 lakh annually by raw spices as well as value added items to nearly 19 countries in the world and growth rate is 14.67 per cent per annum (Anonymous (2014) [1]. There is good potential for increasing export of coriander, if production as well as quality is increased. The level of productivity in coriander is comparatively low as compared to other countries. There are many constrains attributed to low productivity. The lack of resistant varieties against insect and diseases are one of the main regions for low productivity. Stem gall disease caused by *Protomyces macrosporus* Unger is an important disease in all coriander growing area of Madhya Pradesh, Bihar, Uttar Pradesh and adjoining district of Rajasthan. The disease manifests itself in the form of galls on stems, branches, leaves, petioles and fruits, causes 15-20 per cent yield loss (Pandey and Dange, 1998) [13] and deteriorates quality of seeds (Lakra, 1993) [10]. Application of fungicides like organo mercurials, copper fungicides, antibiotics, Bavistin, Thiram, Capton, Blitox-50 and Propiconazole have gave better results for controlling the disease. Over dose application of chemicals caused hazardous effects and residual problems in leaves as well as seed grains. Thus situation triggered interest in searching alternates for disease control. Panchagavya is an organic formulation, which is obtained from five products of cow milk, ghee, curd, dung and urine. It has potential to play the role for promoting growth and providing immunity to plant system. It is also used as fertilizers and pesticides in agricultural operations (Galindo *et al* 2007) [6]. Because it is a mixed culture of naturally occurring beneficial microbe's mostly lactic acid bacteria, yeast, actinomycetes, photosynthetic bacteria and certain fungi. Which promote the growth of plants and providing resistance against pest and diseases (Tharmaraj *et al*, 2011) [18]. The ingredient of 'Panchagavya' *viz*. Urine, dung, milk, curd and ghee are capable of treating many diseases and have several medicinal properties (Pathak and Kumar, 2003). Thus it is the best remedy to cure fungal and bacterial diseases because that has excellent germicidal power, antibiotic and antimicrobial activity (Jandaik *et al*, 2015 and Mishra *et al*, 2015) [7, 11]. Hence, considering economic importance and seriousness of the disease, present research work has been under taken.

Materials and Methods

The experiment was conducted at main experiment station (MES), Department of Vegetables Science, N.D. University of Agriculture & Technology Kumarganj, Ayodhya (UP), India during rabi-2016-17.

Collection of Cow Urine and cow dung

Fresh cow urine and cow dung were collected in a sterile container from a local variety of cow, college of veterinary & Animal husbandry at Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya. The urine was filtered through Whatman No. 1 filter paper to get rid of debris and precipitated material was stored in airtight container at 4°C before use. Cow dung slurry was prepared with adding equal amount of water (w/v).

Preparation of panchagavya

Fresh five products of cow such as Cow dung = 1kg, Cow urine = 3L, Cow milk = 2L, Curd = 2kg, Cow ghee = 1kg were collected for making panchgavya. Required quantities of five ingredients were thoroughly mixed in a plastic container and allowed to ferment for 7 days with twice stirring per day (Chadha 2012) [4].

Treatments Details

The experiment was lead out using stem gall susceptible Variety NDCor - 2 in a Randomized Block Design with three replication and 11 treatments *viz*; T1: Seed treatment and soil drenching with cow urine @ 10% concentration. T2: Seed treatment and soil drenching with cow urine @ 20% concentration. T3: Seed treatment and soil drenching with cow urine @ 30% concentration. T4: Seed treatment and soil drenching with Cow dung slurry @10% concentration. T5: Seed treatment and soil drenching with Cow dung slurry @20% concentration. T6: Seed treatment and soil drenching with Cow dung slurry @ 30% concentration. T7: Seed treatment and soil drenching with Panchagavya (cow urine+ cow dung+ curd + milk+ghee) @ 30% concentration. T8: Seed treatment and soil drenching with Thiram @ 0.25%. T9: Seed treatment and soil drenching with Carbendazim @ 0.2%. T10: Seed treatment and soil drenching with Propiconazole @ 0.2%. T11: Control. The plot size was 2 X 2.4 m2 accommodating six rows with row to row distance 40 cm and plant to plant distance 20 cm. Observations were recorded on number of days required for gall appearance, per cent disease intensity, per cent disease control, disease severity on leaves, stem, inflorescence. Percent Disease Intensity (PDI) was calculated by adopting standard formula.

$$(PDI)=\frac{\text{Sum of all numerical value}}{\text{Total number of leaves examined x maximum grade}}\ x100$$

Where

PDI= Percent disease intensity

Percent Disease Control (PDC): Per cent disease control was calculated as per formula given by (Kushalappa and Ludwig, 1982).

$$\text{Diseses e control}(\%)=\frac{C-T}{C}\times 100$$

Where,

C = Per cent disease intensity in untreated, T = Per cent disease plot intensity in treated plot

Statistical analysis: All the data for each character were statistically analyzed following with procedure of control RBD. Coriander yield of different treatments were recorded to measures the effect of individual's treatments on the yield. The per cent values were converted into Arc sin transformed values and statistically analyzed (Fisher and Yate's 1968).

$$\text{Sin}^{-1}\sqrt{\text{PDI before statistica l analysis}}$$

Results and Discussion

The days required for gall appearance in seeds was maximum in chemical treatment (105.00-106.66 days) and significantly at par between in organic treatments (102.66-104.33 days). Effect of Panchagavya, cow urine and cow dung slurry @ 30% concentration was significant for days required to gall formation on all parts of plants in comparison to control (Table 1). Results presented in Table (2) indicated that all treatments were significantly effective for reducing the stem gall disease. The minimum disease intensity was recorded in seed treatment + soil drenching with panchagavya @ 30% concentration (16.00%) followed by cow urine @ 30% concentration (16.33%), cow dung slurry @ 30% concentration (19.00%), cow urine @ 20% concentration (20.00%), and cow urine @ 10% concentration (23.66%) at flowering stage. At maturity stage the disease intensity was lowest in panchagavya (26.66%) and highest in cow dung slurry @ 10% concentration (38.66%). The per cent disease severity (PDS) on leaves was significantly minimized by all treatments. The reduction was markedly higher in propiconazole (14.00%), carbendazim (15.66%) and panchagavya (17.66%) as compared to thiram (18.33%), cow urine @ 30% concentration (19.00%) and cow dung slurry @ 30% concentration (19.66%) in leaves. On stem the decrease was highest in panchagavya (25.00%) and propiconazole (27.33%) followed by cow urine @ 30%concentration (31.66%), cow dung slurry @ 30% concentration (36.66%) and carbendazim (39.00%). While in inflorescence the minimum disease severity was also found in panchagavya (17.00%) and maximum in cow dung slurry @ 10% concentration (33.33%). Organic treatments markedly decreased the stem gall disease intensity at all stages of plant growth. The maximum reduction was observed in panchagavya (49.60%), cow urine @ 30% concentration(48.76%) and cow dung slurry @ 30% concentration (40.58%) as compared to cow urine @ 20% concentration (37.19%), cow urine @ 10% concentration (25.89%) and cow dung slurry @ 20% concentration(21.54%) at flowering stage. At maturity stage reduction was highest in panchagavya (49.71%) and lowest in cow dung slurry @ 10% concentration (26.88%). In case of fungicides the maximum reduction was observe in propiconazole (51.70, 49.57%), followed by carbendazim (44.60, 39.48%) at flowering and maturity stage respectively. Fungicides are found significant with control and at par with panchagavya, cow urine and cow dung slurry @ 30% concentration. The increase of coriander yield was significant in organic treatment over control and at par with fungicides. Review of current trends in organic practices showed improved yields in crops of rain fed area in India especially during drought years (Singh *et al.* 2001) [17]. Natrajan (2002) [12] reported that panchagavya enhances the growth and yield of crops including resistances to pest and disease and improve the keeping quality of vegetable and fruits. Chemical fungicides are disturbing the physiochemical properties of soil and soil microbial population (Raj *et al*

2014) [15]. Besides, it leads to environmental degradation. Hence organic treatments used in this study were sought to improve crop establishment and health. Cow urine, cow dung slurry and panchagavya have been delayed the gall appearance in all parts of the plant. Earlier workers reported the antifungal activity of the cow urine (Basak and Lee 2015) [3], Cow dung (Ashlesho *et al*, 2008) [2] and Panchagavya (Joseph and Sankarganesh, 2011) [8] against soil borne pathogens (*Fusarium oxysporium F.* sp. *Cucumerinum, F. solani* and *Rhizoctonia solani*). These antifungal properties may be attributed to the presence of antimicrobial substances in cow dung such as Patulodin like compound CK 2108A and CK 2108B produced by *Eupenicillium bouifirmosum* present in cow dung. The effect was found highest in panchagavya. It is might be release of antimicrobial compounds by microorganisms (bacteria, fungi and actinomyces) present in panchagavya at all three concentration ie. 10, 20 and 30%. Basak and Lee (2005) [3] had found inhibitory activities of cow urine and cow dung both *in vitro* and *in vivo* conditions. The inhibitive activities of pathogen increased with increasing concentration of these bio matters. So it is indicated clearly that toxicity of these bio matters against the pathogens depends on their concentrations. More over direct application of cow dung on the infected plants may cause the death of plant due to having high toxicity. Panchagavya is the richest source of all liquid manures in nutrition and essential microbial population. Chadha *et al* (2012) [4] were reported significant effect of panchagavya as foliar spray for control the stalk rot of cauliflower by panchagavya. Cow dung slurry is composed of many digested and undigested plant materials so it is very easy to protect plants creating toxic barriers against the pathogen. More over the chemicals as gases form present in cow urine may be evaporated after application to the plants, thus inhibitory effect of cow urine may be decreased in comparison to cow dung (Basak and Lee 2005) [3]. However, fungicides were found effective for managing stem gall disease, but they are hazardous to environment and soil structure, therefore present experiment provide a new technology for controlling plant pathogens and enhancing crop productivity which is cheap and safeguard for plant, soil and human health.

Table 1: Effect of organic treatments on the days of gall appearance in different parts of coriander

S. No.	Treatments	Gall appearance (DAS)			
		Leaf	Stem	Inflorescence	Seed
1.	Seed treatment and soil drenching with Cow urine @ 10 % concentration.	69.00	77.00	102.33	102.66
2.	Seed treatment and soil drenching with Cow urine @ 20 % conc.	71.00	77.66	103.33	103.66
3.	Seed treatment and soil drenching with Cow urine @ 30 % conc.	71.00	79.00	103.66	104.33
4.	Seed treatment and soil drenching with Cow dung slurry @ 10% conc.	69.00	76.33	102.00	102.66
5.	Seed treatment and soil drenching with Cow dung slurry@ 20% conc.	71.00	73.66	103.00	103.66
6.	Seed treatment and soil drenching with Cow dung slurry @ 30% conc.	71.00	77.66	103.66	104.00
7.	Seed treatment and soil drenching with Panchagavya @ 30% conc.	71.00	79.00	103.66	104.33
8.	Seed treatment and soil drenching with Thiram @ 0.25%. conc.	71.00	80.33	104.00	105.00
9.	Seed treatment and soil drenching with Carbendazim @ 0.2% conc.	73.00	80.33	104.00	105.66
10.	Seed treatment and soil drenching with Propiconazole @ 0.2% conc.	75.33	80.33	104.66	106.66
11.	Control-	69.00	72.33	101.00	102.33
	SEm±	1.62	2.62	1.15	1.16
	CD at 5%	4.79	7.61	3.39	3.43
	CV %	4.0	5.9	1.9	1.9

DAS= Day after sowing, Conc. = Concentration

Table 2: Effect of organic treatments on percent disease intensity of stem gall of coriander

S. No.	Treatments	Flowering stage		Maturity stage	
		Per cent disease intensity	Per cent disease control	Per cent disease intensity	Per cent disease control
1.	Seed treatment and soil drenching with Cow urine @ 10 % conc.	23.66 (29.07)	25.89 (30.28)	35.33 (36.46)	32.70 (34.77)
2.	Seed treatment and soil drenching with Cow urine @ 20 % conc.	20.00 (26.54)	37.19 (37.47)	33.33 (35.24)	36.83 (37.29)
3.	Seed treatment and soil drenching with Cow urine @ 30 % conc.	16.33 (23.82)	48.76 (44.29)	29.33 (32.77)	44.45 (41.78)
4.	Seed treatment and soil drenching with Cow dung slurry @ 10% conc.	26.33 (30.86)	17.61 (24.71)	38.66 (38.44)	26.88 (31.18)
5.	Seed treatment and soil drenching with Cow dung slurry@ 20% conc.	25.00 (29.98)	21.54 (27.34)	38.66 (38.44)	26.82 (31.04)
6.	Seed treatment and soil drenching with Cow dung slurry@ 30% conc.	19.00 (25.77)	40.58 (39.49)	30.00 (33.20)	43.19 (41.06)
7.	Seed treatment and soil drenching with Panchagavya @ 30% conc.	16.00 (23.55)	49.60 (44.77)	26.66 (31.06)	49.71 (44.83)
8.	Seed treatment and soil drenching with Thiram @ 0.25% conc.	18.66 (25.55)	41.65 (40.12)	34.00 (35.65)	35.49 (36.46)
9.	Seed treatment and soil drenching with Carbendazim @ 0.2% conc.	17.66 (24.81)	44.46 (41.78)	32.66 (34.84)	39.48 (38.85)
10.	Seed treatment and soil drenching with Propiconazole @ 0.2% conc.	15.33 (22.98)	51.70 (46.01)	26.66 (31.08)	49.57 (44.75)
	Control-	32.00 (34.44)	00.00 (00.00)	53.00 (46.72)	00.00 (00.00)
	CD (at 5%)	3.24	8.01	2.81	5.26
	CV %	7.04	13.75	4.61	8.88

Figure in parenthesis is Arc Sine square transformation need values
Conc. = Concentration

Table 3: Effect of organic treatments on percent disease severity of stem gall in different parts of coriander

S. No.	Treatments	Leaf	Stem	Inflorescence	Seed gall
1.	Seed treatment and soil drenching with Cow urine @ 10 % conc.	25.00 (29.97)	40.00 (39.21)	29.33 (32.73)	22.33 (28.17)
2.	Seed treatment and soil drenching with Cow urine @ 20 % conc.	22.66 (28.39)	40.00 (39.21)	25.33 (30.08)	21.33 (27.50)
3.	Seed treatment and soil drenching with Cow urine @ 30 % conc.	19.00 (25.80)	31.66 (34.22)	22.00 (27.91)	18.00 (25.08)
4.	Seed treatment and soil drenching with Cow dung slurry @ 10% conc.	29.33 (32.77)	45.33 (42.31)	33.33 (35.22)	24.33 (29.54)

5.	Seed treatment and soil drenching with Cow dung slurry @ 20% conc.	25.33 (30.21)	41.66 (40.19)	29.66 (32.95)	22.33 (28.17)
6.	Seed treatment and soil drenching with Cow dung slurry @ 30% conc.	19.66 (26.30)	36.66 (37.22)	25.33 (30.17)	20.00 (26.54)
7.	Seed treatment and soil drenching with Panchagavya @ 30% conc.	17.66 (24.81)	25.00 (29.97)	17.00 (24.33)	15.00 (22.59)
8.	Seed treatment and soil drenching with Thiram @ 0.25% conc.	18.33 (25.24)	42.66 (40.77)	32.33 (34.64)	17.00 (24.30)
9.	Seed treatment and soil drenching with Carbendazim @ 0.2% conc.	15.66 (23.31)	39.00 (38.61)	28.00 (31.91)	16.00 (23.49)
10.	Seed treatment and soil drenching with Propiconazole @ 0.2% conc.	14.00 (21.96)	27.33 (31.94)	26.66 (30.94)	14.33 (22.21)
11.	T11- Control-	34.66 (36.04)	55.00 (47.88)	36.66 (37.26)	29.00 (32.55)
12.	CD (at 5%)	3.42	4.92	5.17	3.62
13.	CV %	7.26	7.55	9.59	8.07

Figure in parenthesis is Arc Sine square transformation need values
Conc. = Concentration

Acknowledgements
The authors are thankful to the Head, Department of Vegetable Science, Narendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya- U.P. for providing necessary facilities and the financial grant for conducting the trial.

References

1. Anonymous. Annual report of National Horticulture Board New Delhi, 2014, 16-17.
2. Ashlesha, Sugha SK. *In vitro* antifungal bio efficacy of microbes present in panchgavya against major soil borne pathogens. Plant Disease Research. 2008; 23(1):68-74.
3. Basak A, Band Lee MW. Efficacy of cow dung in controlling root rot and *Fusarium* wilt of cucumber. Indian Journal of Plant Pathology. 2005; 23(1&2):81-84.
4. Chadha Sanjay, Rameshwar, Ashlesha, Saini JP, Paul YS. *Vedic Krishi*: Sustainable livelihood option for small and marginal farmers. Indian Journal of Traditional Knowledge. 2012; 11(3):480-486.
5. Fisher RA, Yates. Statistical method for research worker Oliver and Boyd Ltd. Edin burgh and London, 1968, 10.
6. Galindo A, Jeronimo C, Spaans E, Weil M. An introduction to modern agriculture. Tierr Tropical. 2007; 3(1):91-96.
7. Jaindaik Savita, Thakur Preeti, Kumar Vikas. Efficacy of cow urine as plant growth enhancer and antifungal agent. Advances in Agriculture. 2015; 7:ID620368.
8. Joseph B, Sankar Ganesh P. Antifungal efficacy of panchagavya. International Journal of Pharm Tech Research. 2011; 3:585-588.
9. Kushalappa AC, Ludwig A. Calculation of apparent infection rate in plant diseases Development of a method to correct for host growth. Phytopathology. 1982; 72:1373-1377.
10. Lakra BS. Effect of depth and amount of inoculum and time of inoculation of chlamydospores of *Protomyces macrosporus* in infectivity and severity of coriander. Plant Disease Research. 1993; 5(1):118.
11. Mishra RS, Ramveer, Pandey VP. Antifungal effect of cow urine extracts against *Colletptrichum capsici* causing leaf spot disease of turmeric, African Journal of Biotechnology. 2015; 14(20):XXX-XX, XX-XXX.
12. Natarajan K. Panchagavya: A manual, Other India Press, Mapusa, Goa, India, 2002, 33.
13. Pandey RN, Dange SRS. Diseases of coriander and fennel- a review. Agricultural Review Karnal. 1998; 19(2):120-125.
14. Pathak ML, Kumar A. Cow praising and importance of panchagavya as medicine, Sachitra Ayurveda. 2003; (5):56-59.
15. Raj Abhishek, Kumar Manoj, Toppo Pratap Jhariya. Cow dung for ecofriendly and Sustainable productive farming. Environmental Science. 2014; 3:2277-8179.
16. Sanjutha S, Subramanian S, Rani I, Maheswari. Integrated Nutrient Management in Andrographis paniculata. Research Journal of Agriculture and Biological Sciences. 2008; 4(2):141-145.
17. Singh GR, Chaure NK, Parihar SS. Organic Farming for sustainable agriculture Indian Farmer. 2001; 52:12-17.
18. Tharmaraj K, Ganesh P, Kumar Suresh R, Anandan A, Kolanjinathan K. A critical review on Panchagavya-a boon plant growth, International Journal of Pharmaceutical and Biological Archive. 2011; 2(6):1611-1614.