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Management of Yellowing and Spike shedding in Black Pepper at Kodagu District of Karnataka

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ABSTRACT

Yellowing and spike shedding is one of the major limiting factors in production and productivity of Black Pepper in Kodagu District. A Technology assessment was carried out to evaluate the various technological options for management of yellowing and spike shedding in Devarapura village of Virajpet Taluk, Kodagu district in Karnataka. Four different technologies were assessed for a period of 3 yr from 2018-19 to 2020-21, in a randomized block design replicated five times, comprising of four treatments. The results revealed that, spraying of Black Pepper special (5g/l) during May and September + Spraying of Carbendazim (2g/l) of water during May + Drenching of Arka Microbial Consortium (20 g/l) at the rate of 5 litre per plant during June and September + Soil application of Farm Yard Manure enriched with *Pachonia chlamydosporia* (1kg mixed with 100 kg FYM) during May and September was found to be better with less pooled spike drop (3.09%), reduced pooled yellowing (5.54%) and also resulted in early initiation of spikes as compared to other treatments. Hence, the above mentioned technological package has proved highly effective for getting pooled higher dry yield (8.56 q/ha) from Black Pepper.

Key Words: Black pepper, yellowing, spike shedding, Arka Microbial Consortium.

INTRODUCTION

Black Pepper (*Piper nigrum L.*) the king of spices is one of the important spice commodities of commerce and trade in India since pre-historic period. It originated in the tropical evergreen forests of the Western Ghats of India. Pepper is used in food and drinks for imparting agreeable flavor and aroma and also used as a preservative (Veerendra *et al*, 2018). It is also used in the production of essential oil for the pharmaceutical and perfumery industries (Parthasarathy and Zachariah, 2008). Pepper is rich in aroma and pungency, which are attributed to the presence of an alkaloid called piperine (Damanhouri and Ahmad, 2014). India is the largest producer of black pepper, growing in about 1.34 lakh hectares with annual production of 48,000 MT and productivity of 761 kg/ha.

Black pepper is cultivated to a large extent in the states of Karnataka and Kerala. Karnataka and Kerala account for 92 per cent of production of black pepper in the country (Anonymous, 2019). Low productivity in pepper is attributed to use of local varieties, lack of appropriate agronomic practices, unavailability of superior planting materials and losses due to incidences of biotic and abiotic stress (Hussain *et al*, 2017). The major problems in Black Pepper cultivation is nutrient imbalance between the soil and plant, which often predispose the pepper plants to diseases including spike shedding and yellowing of leaves (Srinivasan *et al*, 2012). In India, spike shedding of pepper is not limited to either flower drop or berry drop but also take account of berries being failed to develop into normal size. Spike shedding occurs at various stages of flower and fruit development, leading to yield loss of 40 % or even more (Kandiannan *et al,* 1994). Factors leading to shedding of berries include lack of pollination, prolonged drought, heavy rains and sudden change in weather across seasons. Nutrition imbalance between the soil and

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plant predisposes the pepper plants to diseases such as fusarium wilt and slow wilt (Srinivasan *et al,* 2012). Varying degrees of foliar yellowing, defoliation and damages on feeder roots caused by nematodes tend to be misinterpreted as symptoms of nutrient deficiency. Fungi species such as *Fusarium* and *Phytophthora* have been reported to cause yield losses varying from 30 – 64 percent in India (Ravindra *et al,* 2014). Apart from nutrition imbalances, pathological attacks of fungi and nematodes either singly or in their combinations have been associated with yellowing and spike shedding (Thomas *et al*, 2017). Keeping this in view, ICAR-Krishi Vigyan Kendra, Gonikoppal, Kodagu conducted a technology assessment on management of yellowing and spike shedding in black Pepper in Kodagu District of Karnataka.

MATERIALS AND METHODS

On farm Technology assessment for management of yellowing and spike shedding in Black Pepper was carried out at Devarapura village of Virajpet Taluk, Kodagu with 5 farmers and 4 technological options. The four different technologies assessed were T1: spraying of 1% Bordeaux mixture during June and September; T2: Spraying of Carbendazim (2g/l) during May + Drenching of Carbosulfan (2ml/l) + drenching of Copper oxychloride (3 g/l) during June and September; T3: Spraying of Black Pepper special (5 g/l) during May and September + Spraying of Carbendazim (2g/l) during May + Drenching of Arka Microbial Consortium (20 g/l) and applied at the rate of 5 l/ plant, during June and September + Soil application of Farm Yard Manure enriched with *Pachonia chlamydosporia* (1kg mixed with 100 kg FYM) during May and September; T4: Soil application of AYAR (containing calcium, magnesium, sulphur, zinc and boron) 100g/ plant during June and September month + drenching of Arka Microbial Consortium 20g/l (applied at the rate of 5 l per plant) during June and September + Spraying of Carbendazim (2 g/ l) during May. The assessment was laid in randomized block design with 5 replications and 4 treatments. The assessment was carried out for three years (2018-19 to 2020-21). For each treatment, 10 Black pepper vines were taken in five farmers' field. The observations on per cent yellowing, per cent spike shedding and yield (q/ ha) were recorded. The per cent yellowing and spike shedding was calculated at three levels of plant canopy of 0.5 m^2 area, randomly selected, preferably each at lower , middle and upper level of the canopy. The per cent yellowing and spike shedding was computed using the formula given below:

$$\text{Per cent Yellowing} = \frac{\text{No. of leaves showing yellowing symptoms in 0.5 } m^2 \text{ area}}{\text{Total no. of leaves present in a 0.5 } m^2 \text{ area}} \times 100$$

$$\text{Per cent Spike shedding} = \frac{\text{No. of spikes dropped in 0.5 } m^2 \text{ area}}{\text{Total no. of spikes present in 0.5 } m^2 \text{ area}} \times 100$$

RESULTS AND DISCUSSION

Different technologies assessed had a considerable influence on yellowing per cent of black pepper (Table 1). During all the 3 yr, yellowing per cent was significantly lower under T3, which was followed by T4, T2 and T1 in order. However, T1 resulted in higher yellowing per cent as compared to all other treatments. The pooled data showed the following trend for yellowing per cent T3<T4<T2<T1 (5.44<8.66<25.78<29.89 %), respectively. Spike shedding per cent in black pepper showed a decreasing trend (T1>T2>T4>T3) in the following order, respectively during all the years (Table 1). However, pooled data of spike shedding per cent followed the same trend as mentioned above. The lowest pooled spike

Table 1. Management of yellowing and spike shedding in black pepper.

Treatment	Yellowing (%)				Spike shedding (%)				Dry pepper yield (q ha^{-1})			
	Year				Year				Year			
	2018-19	2019-20	2020-21	Pooled	2018-19	2019-20	2020-21	Pooled	2018-19	2019-20	2020-21	Pooled
T1	31.64	29.96	28.08	29.89	20.76	19.76	18.5	19.67	3.92	3.94	4.16	4.01
T2	28.91	24.36	24.07	25.78	16.96	16.58	14.39	15.97	4.76	5.82	5.99	5.52
T3	6.98	5.30	4.35	5.54	3.58	3.10	2.60	3.09	7.38	8.95	9.35	8.56
T4	9.78	8.42	7.78	8.66	4.8	3.88	3.06	3.91	6.88	8.19	8.02	7.70
SEm±	0.23	0.23	0.14	0.10	0.16	0.11	0.17	0.08	0.14	0.16	0.17	0.08
CD (*P*=0.05)	0.72	0.72	0.44	0.29	0.50	0.34	0.52	0.24	0.44	0.48	0.51	0.24

shedding per cent was 3.09 per cent which was obtained by Spraying of Black Pepper special 5 g/l during May and September + Spraying of Carbendazim 2g/l during May + Drenching of Arka Microbial Consortium (20 g/l) and applied at the rate of 5 l per plant during June and September + Soil application of Farm Yard Manure enriched with *Pachonia chlamydosporia* (1kg mixed with 100 kg FYM) during May and September, which was significantly lower as compared to all other treatments. Significantly highest dry pepper yield of 7.38, 8.95 and 9.35 q/ha was recorded by Spraying of Black Pepper special 5 (g/l) during May and September + Spraying of Carbendazim (2g/l) during May + Drenching of Arka Microbial Consortium (20 g/l) and applied at the rate of 5 litre/ plant during June and September + Soil application of Farm Yard Manure enriched with *Pachonia chlamydosporia* (1kg mixed with 100 kg FYM) during May and September, respectively during 2018-19, 2019-20 and 2020-21. The significantly highest and lowest pooled dry pepper yield of 9.35 and 4.16 q/ ha was recorded under T3 and T1, respectively. Soil application of Arka Microbial Consortium will help in fixation of atmospheric nitrogen, solubaliztion of native phosphorous and reduction of *phytophthora* disease incidence (Veerendra *et al*, 2018). *Pochonia chlamydosporia* is a fungal egg parasite which induce plant defense mechanisms by formation of fungal-plant interaction and reduce nematode population in the rhizosphere of Black pepper vines, thereby reducing yellowing per cent (Rosa *et al,* 2013). This may result in early initiation of spike, reduced yellowing and spike shedding and ultimately result in higher yield of Black pepper

CONCLUSION

It was found that Spraying of Black Pepper special (5 g/l) during May and September month + Spraying of Carbendazim 2 (g/l) o during May month + Drenching of Arka Microbial Consortium (20 g/l) at the rate of 5 litre/ plant during June and September month + Soil application of Farm Yard Manure enriched with *Pachonia chlamydosporia* (1kg mixed with 100 kg FYM) during May and September performed better in terms of reduction in yellowing per cent, Spike shedding and also resulted in higher yield. While adopting this technology mortality of the vines was also considerably less. The health of the vines were found to better with less spike drop, reduced yellowing per cent and also resulted in early initiation of spikes. Hence, T3 technological option has proven highly effective for harnessing higher yield of pepper vines in Kodagu district of Karnataka.

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