

Improvement of Black Pepper Production Through Biological Means Against Foot Rot (Quick Wilt) Disease

C. Sharmila Bharathi

Professor (Horticulture), ICAR – Krishi Vigyan Kendra, Tamil Nadu Veterinary and Animal Sciences University
Kalasamuthiram, Kallakurichi District (Villupuram II), Tamil Nadu – 606 301

*Corresponding Author:

Black pepper (*Piper nigrum* L.) is a major export-oriented spice crop of India. In Namakkal district it is cultivated in an area of 2340 ha with a productivity of 0.2 tonnes / ha (Source: Department of Horticulture, Namakkal, 2022). In Elangiyampatti village of Kolli hills, the pepper plantation is mainly affected by foot rot disease caused by *Phytophthora capsici*, but growers do not take any control measures, either prophylactic or curative. Some growers spray one per cent Bordeaux Mixture or 0.2 per cent Copper Oxy Chloride before the onset of North East Monsoon. This disease became very severe during May – June and October to January, which resulted 50 – 90 % of drying of pepper vines and 90 % reduction in pepper yield. It is the most destructive of all diseases and all parts of the vine are vulnerable to the disease and the expression of symptoms depend upon the site or plant part infected and the extent of damage. Being a soil borne pathogen, the fungus infected all parts of the plant. Infection at the collar region resulted in sudden wilting, defoliation and death of vines.

Phytophthora capsici of class Oomycetes can survive in a wide range of environmental conditions. The pathogen survives in the soil on infected plant debris throughout the year, which serves as the primary inoculum source in pepper plantations of Kolli hills. Disease spread is through soil, water, rain splash, root contact, contaminated materials, termites and slugs. Low temperature (22.7-29.6°C), shorter duration of sunshine hours (2.8-2.5 h/day) high rainfall (>16 mm/day) and high relative humidity (>71%) contributed towards increase of disease incidence and severity. The infections are initially noticed with the onset of monsoon during May-June period on tender runner shoots which lay spread on the ground. Abundant spores, produced on rotting shoots get splashed around during rain, infecting nearby leaves and stem. With continuous rain splashing the pathogen spread from lower leaves to upper portion of the vine in a step wise fashion. However, root and collar infections continue so long

as soil moisture level is conducive even after monsoon in pepper plantations of Kolli hills.



Fig 1: Application of IISR Microbial consortium to the foot rot affected plants

Fungicidal spray of black pepper against foot rot disease has been adopted by some farmers as an Integral part of maintenance of pepper plantations in Kolli hills. The practice of spraying fungicides has been routinely carried out in the pepper plantations. However, satisfactory control of the disease was not observed resulting in steep fall in pepper yield year after year.

Activities implemented by KVK to tackle the problem

In order to address these issues in Pepper plantations in Kolli hills, KVK, Namakkal has conducted various programmes including FLD on Biological control of foot rot in pepper plantation, off campus trainings, field visit, regular advisory services, demonstration, creating awareness through publications by newspaper and radio talk at Tribal Sub Plan village Elangiyampatti.

The FLD programme was conducted at 25 tribal farmer's field in an area of 5 ha on the black pepper variety Panniyur 1 of 5 -15 years old vine. For each demo 200 vines were used. Bio agents such as

IISR Tricho & PGPR capsule (each 3 capsules /farmer – 1 capsule dissolved in dissolved in 200 litre of water



Fig 2: Application of IISR and PGPR capsule solution to the foot rot affected pepper vines

and it was applied @ 1 litre / vine during the month of July, August and September) and each 5 kg of IISR microbial consortium and pepper booster were supplied to per farmer. Since black pepper is cultivated under the mixed farming system in Elangiyampatti, the age of the pepper vine is very old and fertility of the soil is reduced. Soil nutrient depleted by continuous cropping. Hence IISR Micorbial Consortium comprising the combination of three microorganisms namely *Micrococcus luteus*, *Enterobacter aerogenes* and *Micrococcus sp*, which effectively reduced the foot rot incidence and it was applied @ 50 gm / vine along with 3 kg of FYM for faster multiplication of beneficial microbes during the month of July. In addition to that Soil application IISR Pepper booster @ 5g/litre of water was done once during spike initiation stage and another after 2 months.

Output of the intervention



Fig 3: Dried pepper yield obtained from foot rot recovered pepper plantation

Better management of foot rot through timely application of *IISR Tricho* capsules and *PGPR* capsules was observed in demo fields of Elangiyampatti village and farmers felt that capsule form of *T.harzianum* application is very easy when compared to talc formation. The observations on the management of phytophthora foot rot disease in black pepper revealed that reduction of foot rot incidence (82%), less foliar yellowing (14%), less defoliation (17 %), less death of vines (5 %), highest dry berry yield of 1.32 kg per vines and highest net return (Rs.101060/ 0.4 ha) when vines were applied with IISR Tricho, PGPR capsule, IISR microbial consortium and pepper booster in the root zone area during the month of July, August and September. This might be due to suppression of phytophthora population in the soil by timely application of bio inputs, also increase the beneficial microorganism in the root zone area of pepper to combat the foot rot incidence. Enhanced soil nutrient status by application of microbial consortium and pepper booster improved the vegetative and yield performance of pepper vines. Black pepper vines were severely affected by disease with foliar yellowing (45 %), defoliation (57 %) and death of vines (15%) in farmer's practice, application of butter milk (10 lt + 10 lt water = 500 ml / vine at 2 months interval) as soil drenching once after the disease appearance and only to affected vines.

Table 1. Yield performance of Demo vs Farmers practice field

Parameter	Demo	Farmers practice
Yield / vine (kg)	1.32	0.87
Yield (kg / 0.4 ha)	476	315
Reduction of foot rot (%)	82	55
Foliar yellowing (%)	14	45
Defoliation (%)	17	57
Death of vines (%)	5	15
Gross cost (Rs/0.4 ha)	89340	87250
Gross income (Rs/0.4 ha)	190400	126000
Net returns (Rs/ha)	101060	38750
B:C ratio	2.13	1.44

Outcome and impact

Farmers from Elangiyampatti, Vasalurpatti and Veeraganurpatti villages of Kollihills used *Trichoderma harzianum* for the management of foot rot

in black pepper in an area of 52 ha. In addition to that, Department of Horticulture, Kollihills also provided bio inputs for the management of foot rot under Hill area development programme. Foot rot incidence was	(82 %) effectively controlled by the application of bio inputs and also improved the livelihood security of the pepper growers.
--	---

* * * * *