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EFFECT OF DIFFERENT CHEMICALS FOR THE CONTROL OF CITRUS CANKER CAUSED BY *XANTHOMONAS AXONOPODIS* PV. *CITRI*

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Abstract

Citrus canker incited by *Xanthomonas axonopodis* pv. *Citri* is a serious disease of acid lime [*Citrus aurantifolia*] occurs in large areas of the world's citrus growing countries including India Infection causes lesions on the leaves, stems, and fruit of citrus trees, including lime, oranges, and grapefruit. The study was conducted in the acid lime growing area of district Chhindwara block Sausar of Madhya Pradesh, India. In field trial, six chemical were used over the season on acid lime tree to determine their ability to control *Xanthomonas axonopodis* pv. *Citri.* Bordeaux mixture, Fytolon, Streptocycline, Bordeaux Mixture+ Streptocycline, Fytolon + Streptocycline tested at different concentration against multiplication of *Xanthomonas axonopodis* pv. *Citri* . Bordeaux Mixture+ Streptocycline proved more effective as compared to other.

Key words : Citrus canker, acid Lime, *Xanthomonas citri, Citrus aurantifolia,* chemical.

Introduction

Citrus canker is a disease affecting citrus species caused by the bacterium *Xanthomonas axonopodis*. Infection causes lesions on the leaves, stems, and fruit of citrus trees, including lime, oranges, and grapefruit. While not harmful to humans, canker significantly affects the vitality of citrus trees, causing leaves and fruit to drop prematurely; a fruit infected with canker is safe to eat, but too unsightly to be sold.Plants infected with citrus canker have characteristic lesions on leaves, stems, and fruit with raised, brown, water-soaked margins, usually with a yellow halo or ring effect around the lesion. Older lesions have a corky appearance, still in many cases retaining the halo effect. The bacterium propagates in lesions in leaves, stems, and fruit. The lesions ooze bacterial cells that, when dispersed by windblown rain, can spread to other plants in the area. Infection may spread further by hurricanes. The disease can also be spread by contaminated equipment, and by transport of infected or apparently healthy plants. Due to latency of the disease, a plant may appear to be healthy, but actually be infected. Citrus canker bacteria can enter through a plant's stomata or through wounds on leaves or other green parts. In most cases, younger leaves are considered to be the most susceptible. Also, damage caused by citrus leaf miner larvae (*Phyllocnistis citrella*) can be sites for infection to occur. Within a controlled laboratory setting, symptoms can appear in 14 days following inoculation into a susceptible host. In the field environment, the time for symptoms to appear and be clearly discernible from other foliar diseases varies; it may be on the order of several months after infection. Lower temperatures increase the latency of the disease. Citrus canker bacteria can stay viable in old lesions and other plant surfaces for several months. *Xanthomonas axonopodis* has the capability to form a biofilm for attachment on the host. The biofilm is the result of the production of extracellular polysaccharides (xanthan). The biofilm ensures the virulence and epiphytic survival of *X. axonopodis* pv. *citri* prior to the development of citrus canker. In addition, the bacteria secrete transcriptional activator-like (TAL) effectors through type III secretion

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system. The effector interacts with host machinery to induce transcription for genes that regulate plant hormones such as gibberellin and auxin. Wind-driven rain plays major role in the dispersal of *X. axonopodis*. The bacteria are said to be readily dispersed by splashed rain and wind and the quantity of *X. axonopodis* declines after the first event of wind-blown rain dispersal. Apart from that, the bacteria also favor warm weather. The cases of citrus canker are more acute in areas that receive high rainfall and high mean temperature such as India. Often, cankers emerge briskly during fall, slowly during winter and most rapidly in mid to late spring.

Materials and Methods

An experiment was set up in a farmer's field (acid lime orchard) Sausar Block of Chhindwara district, Madhya Pradesh, India, using an effect of chemical on the development and incidence of citrus canker during 2016 -2017. Six year old, healthy acid lime plants variety Kagji Nembo were sprayed with Bordeaux Mixture (1%), Fytolon (3%), Streptocycline (200 ppm), Bordeaux Mixture+ Streptocycline (1% + 200 ppm), Fytolon + Streptocycline (0.3% + 200 ppm). The chemical were applied as aqous solution spray on the tree starting from July to December at 30 days interval. Total four sprays were given. Prior to spraying the disease incidence was recorded in four randomly selected branches of four direction and every application disease incidence was recorded suspension with the help of spray machine with a pressure of 1.1 kg cm^{-2}.

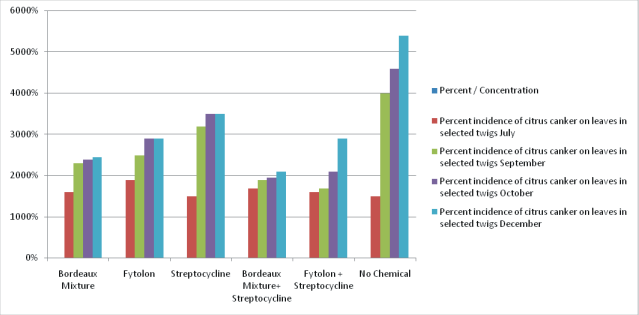

Fig. 1 : Effect of chemicals on the development and incidence of citrus canker (*Xanthomonas axonopodis* pv. *Citri*).

Results

With four application of aqous solution of Bordeaux mixture (1 percent) amended with Streptocycline (200 ppm) the incidence of canker on leaves was minimum (4 percent) as compared to check where 39 percent (table 1) infection was recorded. The found effective on the development in disease incidence was only 8 percent. The synergistic effect of antibiotic and fungicide was recorded in the trail. There was a maximum development of the disease during July 2016 to September 2016 as in rainy season the discrimination of the bacterium was maximum as indicted by the infection of leaves 15 percent in July 2015 increased by 25 percent in September 2016.

Discussion

Asiatic citrus canker induced by *X. axonopodis* pv. *citri* has re-emerged as potential threat to citrus plantation throughout the world (Gotwald *et al*., 2001). The citrus cultivars previously known to be resistant to this pathogen have now become susceptible. Once this disease becomes endemic in an area, it is very difficult to manage with commercially acceptable methods under favorable conditions for disease development (Das, 2003), one component of integrated disease management is the use of chemicals for bacterial plant pathogens. Worldwide use of copper based bactericides is considered like Bordeaux mixture to be the standard control measure for citrus canker (Koizumi, 1985; Leite & Mohan, 1990). Bordeaux mixture, Streptocycline and both combination were application as multiple doses reduced the bacterial population on the leaf surfaces on the susceptible host (Stall *et al*., 1980).

Conclusion

With four applications of quos solution of cooper sulphate preparation as Bordeaux mixture 1 percent

Table 1 : Effect of chemicals on the development and incidence of citrus canker (*Xanthomonas axonopodis* pv. *Citri*).

Treatment	Percent/Concentration	Percent incidence of citrus canker on leaves in selected twigs			
		July	September	October	December
Bordeaux Mixture	1 %	16.00	23.00	24.00	24.50
Fytolon	0.3 %	19.00	25.00	29.00	29.00
Streptocycline	200 ppm	15.00	32.00	35.00	35.00
Bordeaux Mixture+ Streptocycline	1 % + 200 ppm	17.00	19.00	19.50	21.00
Fytolon + Streptocycline	0.3 % + 200 ppm	16.00	17.00	21.00	29.00
No Chemical	0 %	15.00	40.00	46.00	54.00

amended with Streptecycline 200 ppm the incidence of citrus canker was recorded. The effect of chemical on the development and citrus canker incidence within the orchards was significant.

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