Int.J.Curr.Microbiol.App.Sci (2018) *7*(11): 583-586

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 11 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.711.070

Effect of Different Soil Types on the Growth of *R. solanacearum*

R.V. Kadam* and G.P. Jagtap

Department of Plant Pathology, College of Agriculture, VNMKV, Parbhani, India

**Corresponding author*

Keywords

Ralstonia solanacearum, Black soil, Red soil and sandy soil

Article Info

Accepted:
07 October 2018
Available Online:
10 November 2018

A B S T R A C T

Among all the soil types (Red soil, Black soil and Sandy soil) tested, maximum colonies were found in Black soil (115 colonies) with irregular to round, dull white with slight pink center growth and pH, EC, Organic Carbon, $CaCo_3$, N, P_2O_5 and K_2O were 7.00, 0.335dsm^{-1}, 4.87 g/kg, 44.50 g/kg, 315.00 kg/ha, 8.06 kg/ha, 394.88 kg/ha respectively. This was followed by red soil (82 colonies) with irregular to round, dull white with slight pink center growth and pH, EC, Organic Carbon, $CaCo_3$, N, P_2O_5 and K_2O were 7.59, 0.134dsm^{-1}, 2.92g/kg, 11.50 g/kg, 25.08 kg/ha, 10.40 kg/ha, 165.20 kg/ha respectively. Minimum colonies (44) in Sandy soil with Irregular to round, dull white with slight pink centreand pH, EC, Organic Carbon, $CaCO_3$, N, P_2O_5 and K_2O were 7.80, 9.907 dsm^{-1}, 2.60 g/kg, 249.00 g/kg, 95.00 kg/ha, 1.496 kg/ha, 210.56 kg/ha respectively.

Introduction

India is considered as a *"magical land of spices"*. No other country in the world has such a diverse variety of spice crops as India. Indian spices are known for their excellent aroma, flavor and pungency not easily matched by any other country. India has been a leading spice-producing, consuming and exporting country of the world.

Ginger is obtained from the underground stems or rhizome of *Zingiber officinale* (Rosc.) a herbaceous tropical perennial belonging to the family Zingiberaceae. It is usually grown as an annual. The whole plant is refreshingly aromatic, but it is the underground rhizome (raw or processed) which is valued as spice. Its medicinal value is increasingly being recognized nowadays. Ginger originated in South-East Asia, probably in India. The name itself supports this view. The Sanskrit name 'Singabera' has given rise to Greek '*Zingiberi'* and later the generic name *Zingiber*. Ginger grows well in warm and humid climate and is cultivated from sea level to an altitude of 1500 meters above sea level.

Ginger can be grown both under rain fed and irrigated conditions. For successful cultivation of the crop, a moderate rainfall at sowing time till the rhizomes sprout, fairly heavy and well distributed showers during the growing period and dry weather for about a month before harvesting are necessary.

Ginger thrives best in well drained soils like sandy loam, clay loam, red loam or lateritic loam. A friable loam rich in humus is ideal.

However, being an exhausting crop it is not desirable to grow ginger in the same soil year after year.

Ginger is cultivated in several parts of the world and the most important countries being *viz.*, India, China, Nigeria, Sierra Leone, Indonesia, Bangladesh, Australia, Fiji, Jamaica and Nepal. Among them, India and China are the dominant suppliers to the world market. In terms of quality, Jamaican and Indian ginger is considered of superior quality followed by West African type. Jamaican ginger possesses delicate aroma and flavor and is sometimes through considered as first grade. Indian ginger entering the world market as 'Cochin' and 'Calicut'.

The refreshing pleasant aroma, biting taste and carminative property of ginger make it an indispensable ingredient of food processing throughout the world. Fresh ginger, ginger powder from dry ginger, oleoresin and oil are all used for this purpose. Ginger crop is affected by several diseases caused by fungi, bacteria, nematodes and abiotic factors. Among the biotic causes bacteria are most important which cause the major diseases *viz.*, Bacterial wilt (*Ralstonia solanacearum*) and Bacterial soft rot (*Erwinia* spp.).

The important fungal diseases include, Rhizome rot/Soft rot (*Pythium aphanidermatum*), Pythium soft rot (*Pythium graminicolum*), Yellows disease (*Fusarium oxysporium* f. sp. *zingiberi*), Sclerotium rot (*Sclerotium rolfsii*), nematode diseases like root knot disease caused by *Meloidogyne* spp. and abiotic causes like Sunburn (due to high light intensity), Lime-induced chlorosis (due to excessive liming in soil). Among the bacterial diseases infecting ginger crop, bacterial wilt caused by *Ralstonia solanacearum* (Smith) Yabuuchi, is one of the most destructive disease causing accountable qualitative and quantitative losses.

Materials and Methods

Effect of soil types on the growth of *R. solanacearum*

The soil samples (Red soil, Black soil and Sandy soil) from wilt affected ginger plants showing typical symptoms of bacterial wilt were collected from farmer's field. For bacterial isolation, 10 g of soil was collected from different area by using clean and dry sterile spatula in a clean polythene bags. Soil sample were collected from upper layer of the farmland where maximum population of microorganism was concentrated. The soil samples were brought to the laboratory and subjected aseptically for isolation of soil borne bacteria by serial dilution method and pour plate method.

For reducing microbial population, 1 g of soil was dissolved in 10 ml of sterile distilled water to make soil suspension. Serial dilution was carried out for getting isolated single colony. During the study, TTC selective medium was used for bacterial growth. Pour plate method was used to get single colonies of pure culture. 1 ml of 10^5 dilution of soil suspension was poured and spreaded over the TTC medium plates by using sterile rod. After incubation for 24 hrs at 28 + 2^{o}C, mucous colonies were formed over the plates. Observation was recorded on the number of colonies appearing after the incubation period by using colony counter. Soil samples were analyzed for recording the value of pH, EC, Organic carbon, $CaCO_3$, N, P_2O_5 and K_2O.

Results and Discussion

Ralstonia solanacearum was grown on Triphenyl Tetrazolium Chloride (TTC) to know the effect of different soil types (Red soil, Black soil and Sandy soil) on the growth of *R. solanacearum* the result obtained are presented in Table 1, Figure 1 and 2.

Among all the soil types (Red soil, Black soil and Sandy soil) tested, maximum colonies were found in Black soil (115 colonies) with irregular to round, dull white with slight pink center growth and pH, EC, Organic Carbon, $CaCO_3$, N, P_2O_5 and K_2O were 7.00, 0.335dsm^{-1}, 4.87 g/kg, 44.50 g/kg, 315.00 kg/ha, 8.06 kg/ha, 394.88 kg/ha respectively.

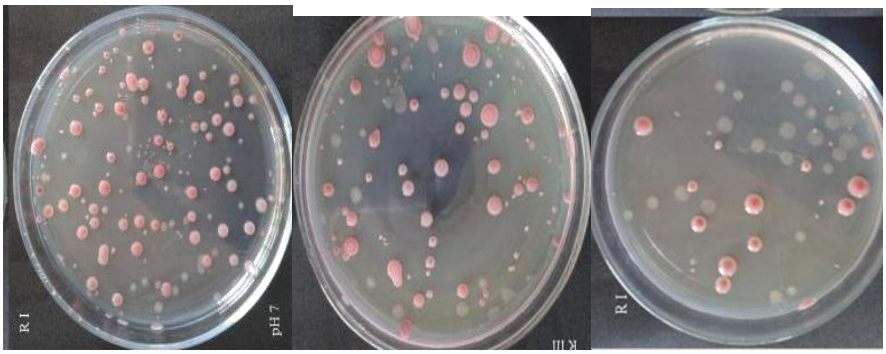
This was followed by Red soil (82 colonies) with irregular to round, dull white with slight pink center growth and and pH, EC, Organic Carbon, $CaCO_3$, N, P_2O_5 and K_2O were 7.59, 0.134dsm^{-1}, 2.92g/kg, 11.50 g/kg, 25.08 kg/ha, 10.40 kg/ha, 165.20 kg/ha respectively.

Minimum colonies observed in Sandy soil (44 colonies) with Irregular to round, dull white with slight pink centre and pH, EC, Organic Carbon, $CaCO_3$, N, P_2O_5 and K_2O were 7.80, 9.907 dsm^{-1}, 2.60 g/kg, 249.00 g/kg, 95.00 kg/ha, 1.496 kg/ha, 210.56 kg/ha respectively.

Table.1 Effect of soil types on the growth of *R.solanacearum*on TZC medium

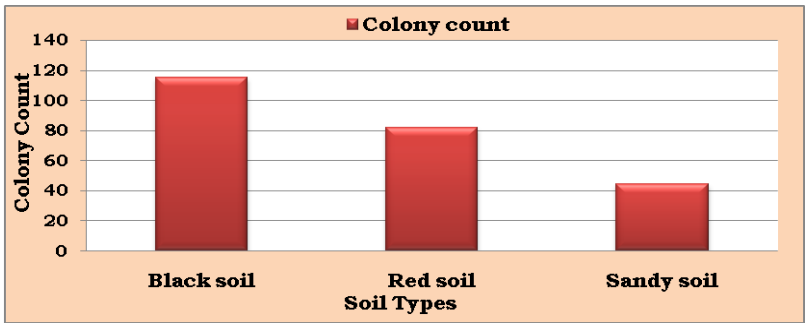
Parameters	Black soil	Red soil	Sandy soil
pH	7.00	7.59	7.80
EC dsm^{-1}	0.335	0.134	9.907
Organic Carbon g/kg	4.87	2.92	2.60
$CaCO_3$ g/kg	44.50	11.50	249.00
N kg/ha	315.00	25.08	95.00
P_2O_5 kg/ha	8.06	10.40	1.496
K_2O kg/ha	394.88	165.20	210.56
Colony count	115	82	44
Colony color	Irregular to round, dull white with slight pink centre	Irregular to round, dull white with slight pink centre	Irregular to round, dull white with slight pink centre

Fig.1 Effect of different soil types on the growth of *R. solanacearum*



Black soil Red soil Sandy soil

Fig.2 Effect of different soil types on the growth of *R. solanacearum*



The present results are in agreement with the findings of Darong*et al.*, 1981; Nesmith and Jenkins, 1983; Hayward, 1991; Van Elsas*et al.*, 2000 and Coutinho, 2005. Among all the soil types (Red soil, Black soil and Sandy soil) tested, maximum colonies were found in Black soil (115 colonies) with irregular to round, dull white with slight pink center growth and pH, EC, Organic Carbon, $CaCo_3$, N, P_2O_5 and K_2O were 7.00, 0.335 dsm^{-1}, 4.87 g/kg, 44.50 g/kg, 315.00 kg/ha, 8.06 kg/ha, 394.88 kg/ha respectively.

Acknowledgement

We are greatly indebted to the dean, College of agriculture, VNMKV, Parbhani for providing us with all the necessary materials and all kinds of support to undertake the study. The first author is greatful to the Guide, Department of Plant Pathology, COH, VNMKV, Parbhani for providing all sorts of facilities and would like to extend gratitude to the laboratory techniciance for their generous support at different stages of the study period.

References

Coutinho, T.A. (2005). Introduction and prospectus on the survival of *Ralstonia solanacearum*. In: Bacterial wilt disease and the *R. solanacearum* species complex. Edited by Allen C. Prior P. Hayward AC. St. Paul. Mn.USA: Aps press.

Darong S., Chen C. and Wang Y. (1981). Resistance evaluation of bacterial wilt *(Pseudomonas solanacearum*) of peanut *(Arachis hypogaea* L.) in the People's Republic of China. Proceedings of American Peanut Research and Education Society. Inc. 13: 21-28.

Hayward, A. C. (1991). Biology and epidemiology of bacterial wilt caused by *Pseudomonas solanacearum*. Annual Review Phytopathol. 29: 65-87.

Nesmith W.C. and Jenkins S.F. Jr. (1983) Survival of *P. solanacearum* in selected North caroline soils. Phytopathology 73:1300-1304.

Van Elsas, J.D., Kastelein, P., Van Bekkum, P., Van der wolf, J.M.., de Vries, P. M. and Van overbeek, L. S. (2000) Survival of *R. solanacearum* biovar 2, the causative agent of potato brown rot in field and microcosm soils in temperate climates. Phytopathology. 90:1358-1366.

How to cite this article:

Kadam, R.V. and Jagtap, G.P. 2018. Effect of Different Soil Types on the Growth of *R. solanacearum*. *Int.J.Curr.Microbiol.App.Sci.* 7(11): 583-586.
doi: https://doi.org/10.20546/ijcmas.2018.711.070