



RESEARCH ARTICLE

POTYVIRUS INFECTION ON GROUNDNUT IN TAMIL NADU, INDIA

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Abstract

Groundnut is one of the major oil seed crop that is commercially and economically important. Groundnuts are rich in proteins and other essential elements. This crop is susceptible to virus, bacteria and fungal infections. One such serious viral infection is caused by a large group of virus belonging to Potyvirus, which leads to the yield loss. Potyvirus show symptoms of Mottling, Vein Clearing, extreme mosaic, sometimes they may be asymptomatic also. Potyviruses occur both in seeds and on the plants. Incidence of Poty virus was screened in leaf and seed samples collected from Tamilnadu, India. About 43.75% of the sample were positive for Potyvirus of which 50% of leaves and 50% of seeds were infected.

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Introduction:-

Groundnut (*Arachis hypogaea* L.) is considered as a one of the important oil crop which benefits economically as it paves way for oil Production. Seeds are rich in 50% oil, 30% protein and most vitamins, minerals and bioactive compounds (Janila et al., 2012) Since it is rich in oil and other sources, it is easily susceptible to microbes. Most of the microbes such as bacteria, fungi and virus easily affect the groundnut crops which drastically leads to yield loss. Area of groundnut in Tamilnadu majorly grown in the districts of Thiruvallur, Villupuram, Thiruvanamalai, Namakkal, Erode, Ranipet, Ariyalur, Cuddalore etc

One of the viral disease is caused by potyvirus belonging to the family Potyviridae. Potyvirus named after Potato Virus Y (PVY) is one of the largest groups in plant virus has 180 members distinctly which is 30% of all known plant virus that affects agricultural and ornamental plants. This virus has a significant inclusion body which may be pinwheel or scroll shaped. Virions are rod and flexuous, 680 to 900 nanometres long with 11 to 15 nanometres wide made of 2000 units of structural proteins (Riechmann et al., 1992). Potyvirus made of ssRNA, i.e. Single Stranded RNA which is about 10 kb long and it is surrounded by 2000 copies of Coat protein units (Urcuqui-Inchima et al., 2001). Speaking about the yield loss due to potyvirus, Potato Virus Y and Plum Pox virus of potyvirus occupy top 10 position in causing yield loss. Transmission of Potyvirus is mainly through aphids and sometimes seed borne (Ivanov et al., 2014). Symptoms of the potyvirus include mosaic stripe, mottling, vein clearing and banding, necrosis chlorosis, flower breaking and yield losses (Sharma et al., 2014).

The main objective of the study is to determine the disease severity of potyviruses both qualitatively and quantitatively in Tamilnadu.

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Materials and Methods:-

Collection of Plant Materials:

Leaf samples with Mosaic, Vein Banding, Mottling were collected from districts of Tiruvallur, Ranipet, Villupuram, Tamil Nadu and Tirupathi district in Andhra Pradesh, India. Seed samples were mostly collected from farmers of Thiruvallur, Villupuram, Thiruvanamalai, Dindugal, Ariyalur and Coimbatore districts in Tamilnadu and Tirupathi and Chittoor districts in Andhra Pradesh, India. Both healthy and diseased leaves were collected. The samples were stored in deep freezers (-20 °C). The seed varieties collected were K6, K2, TMV 2, TMV 7, TMV10 and TMV 14 and also TCGS 894. Of the 64 samples, 1:1 ratio of leaf and seeds samples were screened.

Detection Of Potyvirus Using ELISA Kit

Poty virus Screening Kit (Agida) was purchased from Life Technologies, India. The samples were grinded with IEB buffer and 100 microliters placed in the ELISA plate and rested for an hour. After an hour washed the plates with wash buffer and added ECL buffer and kept in dark for 12 hours. Then add Enzyme Conjugate and Substrate and the chromogen formed was read using ELISA reader at 650 nm.

Results:-

Most of the potyvirus can be detected using serological techniques. Indirect enzyme linked immunosorbent assays (Indirect ELISA) can be performed for practical purpose and easily detect more plant samples (Nascimento et al., 2017). On adding the stop solution visibility of yellow colour indicates the sample to be positive. However, the colour variation depends on the viral load. Of the 31 samples of leaf and seed respectively 43.75% were positive. The overall percentage of the severity of Potyvirus in Tamilnadu was 43.75%.

Table 1:- Detection of Potyvirus in Leaf Samples.

S.NO	SAMPLE NAME	DISTRICT	POSITIVE/NEGATIVE
01	ARAKONAM 1	RANIPET	+
02	ARAKONAM 2	RANIPET	+
03	ARAKONAM 3	RANIPET	+
04	ARAKONAM 4	RANIPET	+
05	THIRUVALUR 1	THIRUVALLUR	+
06	THIRUVALLUR 2	THIRUVALLUR	+
07	THIRUVALLUR 3	THIRUVALLUR	+
08	SEETHANJERI 1	THIRUVALLUR	-
09	SEETHANJERI 2	THIRUVALLUR	+
10	PERIYAPALAYAM	THIRUVALLUR	+
11	ARAKONAM 5	RANIPET	+
12	NEW GUMMIDIPOONDI	THIRUVALLUR	+
13	CHINLAPURAM	THIRUVALLUR	-
14	SUNAMBUKULAM	THIRUVALLUR	-
15	ELAVUR	THIRUVALLUR	-
16	GUMMIDIPOONDI	THIRUVALLUR	-
17	RAKKAMPALAYAM	THIRUVALLUR	-
18	OBASAMUDRAM	THIRUVALLUR	-
19	THIRUVALLUR 4	THIRUVALLUR	-
20	THREE ROAD	THIRUVALLUR	-
21	THULAMPALAM	THIRUVALLUR	-
22	TINDIVANAM	VILLUPURAM	+
23	POORIVAKKAM	THIRUVALLUR	-
24	POORIVAKKAM	THIRUVALLUR	-
25	PANDI	THIRUVALLUR	-
26	ALAPAKKAM	THIRUVALLUR	-
27	THIRUVALLUR 5	THIRUVALLUR	-
28	VIJAYAGOPALAPURAM	TIRUPATHI	+
29	KANCHANAPUTHUR	TIRUPATHI	+
30	ODAPAI 1	THIRUVALLUR	+

31	ODAPAI 2	THIRUVALLUR	+
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Table 2:- Detection Of Potyvirus In Seed Samples.

S.NO	SAMPLE NAME	DISTRICT	SEED VARIETY	POSITIVE/NEGATIVE
01	SEETHANJERI 1	THIRUVALLUR	K 2	+
02	SEETHANJERI 2	THIRUVALLUR	TMV (Gn) 13	+
03	ODAPAI 1	THIRUVALLUR	TMV 10	+
04	ODAPAI 2	THIRUVALLUR	K 6 WHITE	+
05	ODAPAI 3	THIRUVALLUR	TMV2	-
06	THAZHUTHALI	VILLUPURAM	TMV (Gn) 13	+
07	PERIYAPALAYAM	THIRUVALLUR	TMV (Gn) 13	+
08	ODDANCHATRAM	DINDUGAL	TMV 10	-
09	CHEYYAR	THIRUVANAMALAI	TCGS 894	+
10	VILLUPURAM	VILLUPURAM		-
11	TINDIVANAM 1	VILLUPURAM	TMV 1	+
12	TINDIVANAM 2	VILLUPURAM	TMV 2	-
13	ODAPAI 4	THIRUVALLUR	K 6 WHITE	-
14	ODAPAI 5	THIRUVALLUR	K2	+
15	ODAPAI 6	THIRUVALLUR	K 6 WHITE	+
16	PUDUPATU	THIRUVANAMALAI	TCGS 894	-
17	OTHAMPATU	THIRUVANAMALAI	TMV14	-
18	CHEYYAR 2	THIRUVANAMALAI	TMV 7	-
19	NALLAPALAYAM	VILLUPURAM	TMV10	-
20	NALLAPALAM 1	THIRUVANAMALAI	TMV (Gn) 13	-
21	NALLAPALAM2	THIRUVANAMALAI	TMV 2	-
22	VALLAPALAYAM	VILLUPURAM	TMV 2	-
23	KILMALAYAN GRAMAM	VILLUPURAM	TMV 7	-
24	VILLUPURAM 2	VILUPURAM	TMV 10	-
25	VIRUDACHALAM	CUDDALORE	TMV 2	-
26	B.N. KANDRIGA	TIRUPATHI	TMV 7	-
27	GERUGAMPONDI	THIRUVALLUR	TMV 7	-
28	SIRUVAPURI 1	THIRUVALLUR	TMV 2	+
29	SIRUVAPURI 2	THIRUVALLUR	TMV 7	+
30	JAYAMKONDAN	ARIYALUR	TMV 7	+
31	COIMBATORE	COIMBATORE	TMV 2	+

Conclusion:-

Both seeds and leaves 43.75 % of the samples tested positive. It is evident from the study that Potyviruses prevail in the field of Tamilnadu and it is also seed borne in nature. Confirmation on the seed borne nature needs further investigation.

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All the authors are from Department of Botany, Bharathi Women's College, Chennai 600108, Tamilnadu, India. Corresponding Author is Assistant Professor and all other authors are Research Scholars. All the information provided above are true and there is no conflict of interest.

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