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Effect of temperature on Groundnut (*Arachis hypogaea* L.) Mosaic Virus

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Abstract

Temperature influences the symptom expression of a disease to a great extent. Change in temperature results in a great diversity in type as well as in sequence of symptom expression. Present study shows the effect of temperature on the incubation period and disease development caused by groundnut mosaic virus. Optimum temperature for disease development was found to be 30°C (±2°C) at which incubation period was 11 days. Temperature lower or higher than the optimum increased the incubation period and changed the nature of symptoms. In plants which were kept at 45°C for 20 days and then transferred to normal conditions, no viral symptoms were observed.

The mosaic disease of groundnut observed to be a destructive viral disease as it severely affects the growth and yield of the crop. Temperature plays an important role in disease development. It can change not only the incubation period & severity of the disease, but also nature of the symptoms produced. Marked changes in type of symptoms may result from changes in temperature.

At higher temperature symptoms in new growth become milder and the infection may become completely masked[2], but effects vary widely with different host virus combinations. Liu[3] studied the effects of temperature on symptom expression on sugarcane, infected with different strains of mosaic virus. Symptoms were best observed at 85°F (29.4°C). Fazio and Vicente[1] studied effect of temperature on the tomato white necrosis virus. Tomato seedlings mechanically inoculated with the virus were kept in a culture medium at 15, 20, 25 and 30°C. The optimum temperature for virus multiplication was initially 25°C but later on it was 20°C. Yamaoka *et al*.,[5] observed that the optimum temperature for multiplication of cauliflower mosaic virus in Turnip plants was 20°C but for the formation of Viroplasm matrix it was more than 20°C. Lozoya - Saldana and Dawson[4] studied the effect of regimes alternating between optimum and restrictive temperatures on tobacco mosaic virus in tobacco and cowpea chlorotic mottle virus in cowpea. Infected plants were incubated at 40°C

for 4 hrs., at 25°C for 4 hrs., at 40°C for 6 hrs. and at 25°C for 2 hrs.

To study the effect of temperature on the incubation period and disease development, young healthy seedlings of about 10 days old test plants were inoculated with standard virus inoculation and incubated at different temperatures ranging from 10°C to 45°C. Incubation period and nature of the symptoms produced were recorded in each case. Results are presented in table-1.

Table-1. Effect of temperature on the incubation period and disease development
(Each reading is mean of 5 replicates)

Temperature oC(±2°C)	Number of plants		Incubation period in days	% infection	Nature of symptoms produced
	Inoculated	Infected			
10	20	Nil	-	—	—-
15	20	Nil	-	-	—-
20	20	13	19	65	Chlorosis and rosette
25	20	18	17	90	Mosaic, mottling, chlorosis and rosette
30	20	18	11	90	Mosaic, Mottling, chlorosis, distortion of leaves and rosette
35	20	18	14	90	Mosaic, mottling, chlorosis, distortion of leaves, rosette & chlorotic rings began to appear
40	20	12	19	60	Mottling, mosaic, prominent rings, waves of green & yellow colours and rosette
45	20	Nil	-	-	----

- = symptoms did not appear

It is evident that the optimum temperature for the development of the disease is 30°C (±2°C). Temperature lower or higher than this increased the incubation period and changed the nature of symptoms. At 15°C (±2°C) and below no symptoms appeared. Similarly at 45°C (±2°C) also, complete absence of symptoms was noticed. Results also indicate that with change in temperature, nature of the symptom expression was also changed. At optimum temperature *i.e.* 30°C (±2°C) incubation period was 11 days and at this temperature, the first symptom to appear was mosaic followed by mottling and chlorosis. Results after 11 days began to show clear rosette symptoms and distortion of the leaves. However, at 20°C (±2°C) plants showed chlorosis and rosette only with incubation period of 19 days. At higher temperature i,e. 35°C (±2°C) and 40°C (±2°C), the rosette symptoms were not prominent and at 40°C (±2°C) there was no distortion of leaves. Along with mosaic and mottling, chlorotic rings also began to appear at 35°C which became more pronounced at 40°C. At 40°C (±2°C) leaves also showed waves of green and yellow colour with incubation period of 19 days. Complete masking of symptoms was noted at 45°C (±2°C). Plants kept at 45°C for 20 days and then transferred to normal conditions showed no symptoms.

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