SUMMARY
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Tomato is one of the most popular and widely grown vegetables in the world ranking second in importance to potato in many countries. The fruits are eaten raw or cooked. Large quantities of tomato are used to produce soup, juice, ketchup, puree, paste and powder. By virtue of its many attributes, tomato is also a favourite crop for research in physiology and cytogenetics.

In India, the cultivated tomato suffers from numerous diseases those are caused by viruses. Most of the work have been carried out in respect of conspicuously damaging viruses. In India, Tobacco mosaic virus (TMV), Tomato mosaic virus and Tomato leaf curl virus (TLCV) are most important.

During local survey of districts of Eastern U.P. wide spread of the leaf curl disease of tomato (Lycopersicon esculentum) has been observed. It was also observed that twenty four varieties of tomato was found infected with the leaf curl disease out of fifty examined. The incidence ranged from 7 to 62 %. The maximum incidence (62%) of leaf curl was recorded in the variety Pusa ruby and Pusa early dwarf in the month of August. The major symptoms in naturally infected plants consisted of severe leaf curl mosaic mottling followed by stunting of entire plants and fruits. With such observation and severe incidence
of virus infection on different cultivars of tomato crop in this area of Eastern U.P. have been reported.

All the experiments were carried out in an insect proof chamber. The tomato leaf curl virus (TLCV) was obtained from natural host *Lycopersicon esculentum*. In the normal field and stock culture of the virus was maintained in the chamber on *Lycopersicon esculentum* var. Pusa ruby. For further studies the cultures were multiplied on young and healthy tomato cultivar Pusa ruby and Pusa early dwarf at frequent intervals to have ready and adequate stocks of virus inoculum.

The dilution end point of the virus was found between 10-3 to 10-4, thermal inactivation point between 55°C-65°C and longevity *in vitro* 5-6 hrs at room temperature (30°C±2°C) and 5-6 hrs at 4°C in Pusa ruby and Pusa early dwarf at frequent intervals to have an adequate stock of virus inoculum.

In order to determine the host range of the virus, it was observed that out of 53 species belonging to 11 different families, initial symptoms of the virus appeared only on 10 plants with in 8-10 days of inoculation. Plants like *Solanum tuberosum* L. and *Datura stramonium* L. carried the virus without any symptoms. This indicate a specified host of the virus mostly to plants of families Solanaceae, Cucurbitaceae and Compositae. Common symptoms on *Capsicum annum* L. (Solanaceae) were vein cleaning during younger period followed by severe mottling and light and dark green patches over the leaf surface, curling, marginal rolling in leaf and fruit size with damaged shape were
also noticed.

During the course of the present study, regarding the physical properties of the virus the dilution end point (DEP) was 1:100,00 and the thermal inactivation point (TIP) was between 60°C-65°C. Regarding longevity *in vitro* the virus remained infective in crude sap for 17 days in Pusa ruby and 15 days in Pusa early dwarf cases at room temperature (15°C- 33°C). Virus isolated was easily transmitted by sap inoculation (Mechanically) and white fly were able to transmit the virus with 40,60 and 70 % infection respectively. The virus could not be transmitted by soil, seed or root.

The cross protection tests for tomato leaf curl virus (TLCV) from natural tomato plant. On both tomato cultivars under investigation justified that the virus tomato leaf curl virus (TLCV) is clearly distinct virus of tomato and it was further identified and designated as tomato leaf curl virus.

During present investigation, it was found that the virus produced significant and severe symptoms in summer and rainy seasons (March-October) when temperature was 20-42.5°C, but during winter (November to February) at temperature between 20°C - 22°C, it produced only mild and diffused symptoms.

It has also been observed that symptoms severity of the virus in the cultivars increased gradually infection period till 90 days of inoculation, after which it becomes moderate to milder. A close relationship between decrease or increase in virus concentration and symptom severity existed. The higher
concentration of virus was noticed in leaves harvested on 90 days of inoculation. This indicated that the virus concentration increase in leaves up to 90 days and then gradually declined.

The virus infection reduced the total number of leaves, leaf area, fresh weight of leaves, linear growth of stem, root and their fresh weight. The virus infection decreased the moisture content but increased percent dry matter contents in the plants.

TLCV infection also decreased the relative growth rate, relative leaf area increase and net assimilation rate but increased the leaf area ratio in comparison to their healthy counterparts.

The rate of net production, gross production were reduced but the respiratory loss, was increased in diseased Tomato leaves than their healthy counterparts.

In healthy and diseased plants the respiratory loss, net production and gross production increased with the age of the plants.

The chlorophyll content of both healthy and diseased leaves increased with age of the plants, but in the infected samples (leaf, stem and root) had always lesser amount of chlorophyll than comparable healthy ones.

There was a general increased in peroxidase activity in both healthy and diseased plants with age of the plants. Infected samples (leaf, stem and root) showed more enzymic activity than comparable healthy counterparts.

The catalase activity was always lesser in infected plants in comparison to their healthy counterparts. The maximum enzymic activity was found in the leaves followed by stem and root.
Virus infection increased the polyphenoloxidase activity in comparison to their healthy counterparts. The maximum PPO activity was associated with leaf samples followed by stem and root.

There was a general increase in nitrate reductase activity in both healthy and infected plant samples with age of the plants. The virus infection increased the nitrate reductase activity in comparison to their healthy counterparts. Maximum activity was observed in the leaves followed by stem and root samples.

The virus infection decreased the carbohydrate contents (reducing-non-reducing sugar and starch) of Tomato plants. The levels of carbohydrate fractions were maximum in the leaf followed by stem and root.

The levels of total nitrogen content were increased in the virus infected samples. The increase was gradual throughout the experimental period in both healthy and infected samples. The maximum nitrogen content was found in the stem followed by leaf and root.

The virus infection increased the levels of total protein content in the leaf, stem and root samples than the healthy ones. In healthy and diseased plants the protein content increased continuously with the age of the plant.

Phenolic content was found to be present in higher amounts in infected plant parts throughout the course of study.

The virus infection reduced the number of fruits, its length and the weight of seeds and fruit in both cases. The percent loss in yield was higher in early inoculated plants than the late inoculated once. The maximum percent yield loss was marked in plants inoculated on 15th day of germination while it was minimum in inoculated on 45 day of germination.