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NITRATE REDUCTASE ACTIVITY IN VIRUS INFECTED *SESBANIA SESBAN* (L.) MERR.*

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The effect of naturally occurring Sesbania mosaic virus (SeMV) infection on nitrate reductase activity of *Sesbania sesban*, a green manuring crop, has been studied. Virus infection increased the nitrate reductase (NR) activity throughout the experimental period. Maximum activitity of this enzyme was observed in leaf followed by root and stem. Highest activity was observed at 20th day of inoculation and thereafter the activity of enzyme invariably decreased with the increasing age of plants. Nitrate nitrogen content was also found higher in diseased plant parts in comparison to their healthy counterparts. However, the nigrogen level of pot soil holding diseased plants was found low.

Keywords : Nitrate reductase; *Sesbania;* Sesbania mosaic virus; Nitrate nitrogen.

Nitrate reductase (NR) is a metallo flavo protein (Evans and Nason, 1953) known to be the first enzyme involved in biosynthesis of amino acids and key regulator of influx of reduced nitrogen. Most studies on NR activity in higher plants have been carried out with healthy plant material but similar studies with virus infected plants have received very little attention (Singh and Singh, 1978; Singh and Singh, 1982). Therefore, the present investigation deals with the changes in nitrate reductase activity as well as nitrate nitrogen in *Sesbania* infected with Sesbania mosaic virus (SeMV) at different periods of infection. The study also included the effect of SeMV infection on the uptake of soil nitrogen by the host plant.

All the experiments were performed in insect proof glass house. *Sesbania sesban* (L.) Merr. Var. picta (Prain) cv. Shevari was used as host (test plant) and SeMV (Singh and Srivastava, 1985) as the pathogen for systematic multiplication. Nine day old seedlings of the test plants were taken into two groups of 240 each. The first group of plants was left as

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healthy control while the second group was inoculated with SeMV by the usual sap-inoculation method. Test plants of each group were harvested at 10 day intervals after inoculation. Estimation of NR activity in different *Sesbania* plant parts was made from fresh samples (Srivastava, 1974) and the nitrate nitrogen from oven dried plant materials (Humphries, 1956). The soil nitrogen was estimated by the method described by Misra (1968).

The findings indicate a general increase in the nitrate reductase activity (Table 1) and nitrate nitrogen content (Table 2) in diseased samples (leaf, stem and root). The maximum activity of the enzyme and nitrate nitrogen content were observed in leaf followed by root and stem. The highest activity of enzyme was observed at 20th day of inoculation and thereafter the activity invariably decreased with increasing age of the plants. Nitrogen level in the pot soil of the diseased plants was lower in comparison to the pot soil of the healthy plants (Table 3).

The increased activity of nitrate reductase in infected *Sesbania* plant parts is in accordance with the results obtained earlier (Narayanaswamy and Ramakrishnan, 1966; Singh and Singh, 1982). In virus infected plants, the increased activity of NR indicates enhanced rate of nitrogen assimilation due to accelerated protein synthesis. The higher level of nitrate nitrogen (Table 2) in diseased plant indicate the nitrogen absorption from the soil was accelerated and it was ultimately converted into utilizable forms like nitrite nitrogen for meeting the additional demand of the host plants. The low nitrogen level in the soil (Table 3) of infected plants support this view.

Light plays important role in accelerating the synthesis of nitrate reductase in the plants. The higher activity of NR in the leaves could be explained on the basis of the exposure to the light (Kannangara and Woolhouse, 1967; Aslam *et al.*, 1976). The low NR activity recorded in the roots may be due to its negatively phototropic nature. It seems that conversion of nitrate to nitrite nitrogen in root is slow. It was subtantiated by the lower activity of enzyme in the root (Table 1). Nitrate reductase is known as inducible enzyme by its substrate, the nitrate (Hewitt and Afridi, 1959). In the present study a higher level of nitrate nitrogen was observed in infected *Sesbania* plant parts (Table 2) than healthy ones. The presence of higher amount of substrate (Nitrate nitrogen) in virus infected plant parts could obviously enhance the enzymatic activity recorded here.

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Table 1. Nitrate reductase activity (n moles of No_2^- h^{-1} g^{-1} fresh weight) of *Sesbania* plant parts at different periods of SeMV infection.

Days after inoculation	Leaf		Stem		Root	
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased
10	892	1024	745	752	832	838
20	1184	1248	777	809	982	1008
30	1120	1216	758	780	976	992
40	1088	1104	726	761	928	960
50	1056	1072	717	736	896	934
60	1040	1046	688	713	864	880

Table 2. Nitrate nitrogen content (mg/100 mg dry weight) of *Sesbania* plant parts at different periods of SeMV infection.

Days after inoculation	Leaf		Stem		Root	
	Healthy	Diseased	Healthy	Diseased	Healthy	Diseased
10	0.156	0.165	0.038	0.042	0.105	0.108
20	0.192	0.259	0.056	0.063	0.124	0 136
30	0.242	0.287	0.070	0.091	0.147	0.172
40	0.270	0.294	0.105	0.126	0.190	0.235
50	0.287	0.308	0.108	0.133	0.192	0.259
60	0.262	0.280	0.098	0.120	0.182	0.220

Table 3. Nitrogen (mg/100 mg soil) level of pot soil* of *Sesbania* plants at different periods of SeMV infection.

Days after inoculation	Soil nitrogen	
	Healthy	Diseased
10	0.683	0.673
20	0.728	0.691
30	0.768	0.721
40	0.798	0.757
50	0.813	0.773
60	0.826	0.791

* Original soil nitrogen level 0.732.

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