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Effect of Phenolic Compound in Resistance to Mungbean Yellow Mosaic Virus in Mungbean

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ABSTRACT

The project was undertaken to study the role of phenol against MYMV resistance in mungbean plants in natural condition. The present investigation was undertaken during the spring season at Research Farm of Tirhut College of Agriculture, Dholi, Muzaffarpur, Bihar. Four genotypes of mungbean namely HUM-16, TMV-37, Samrat and LGG 450 has been taken. The estimation of total phenol content protocol was carried out with Folin-Ciocalteu Reagent (FCR) by Bray and Thorpe 1954. The absorbance at 650 nm at 1mg/g concentration of phenol was found to be 0.727 a.u. This value was taken as standard as it is very close to the mean value. Highest value of absorbance at 650 nm was found in TMV 37, followed by HUM 16 and Samrat respectively. LGG 450 showed the least value of absorbance which was in direct correlation with MYMV resistance.

KEYWORDS

Phenol, mungbean, absorbance

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Pulses are known as grain legumes valued for their protein rich grains which have protein content twice or more than cereals. Mungbean (*Vigna Radiata* L.) is one of the cheapest sources of plant protein, which contains about 22-27 per cent protein. It is also good source of mineral such as calcium and sodium. Dried mungbean seeds have high content of vitamin A and B, while the sprouted mungbeans are rich in vitamin B and C. Ascorbic acid is synthesized in sprouted seeds of mungbean with increment in riboflavin and thiamine. These qualities of pulses are sufficient to overcome the protein deficiency. Food legumes are versatile foods as they are a source of many nutrients required for a healthy human body. They are valued as cheaper source of protein and energy as compared to animal protein.

Globally, grain legumes are the second most important group of crops. Among pulses *Vigna radiata* L. (mungbean) and *Vigna mungo* L. (Urdbean) are included in dry beans, which occupy an area of 25.88 million ha and produces 18.13 million tones with an average yield of 701 kg/ha at global level. Mungbean yellow mosaic virus (MYMV) caused by mungbean yellow mosaic virus (MYMV) is one of the most destructive biotic production constraints in mungbean. Yellow mosaic virus (MYMV) infection occurred through whitefly (*Bemisiatabaci*) transmitted begomovirus in mung bean. Development and introduction of resistant cultivars are considered as the most economical and eco-friendly option to manage MYMV.

Plants contain many aromatic compounds with hydroxyl group which are known as Phenols or Phenolics. They are derivatives of Phenol molecules and are diverse in their chemical structure. They were found that presence of phenol leads to resistance against diseases and pests (Vidhyasekaran, 1974, 1975; Link, 1933; Walker and Link, 1935) . The present study was undertaken to estimate the total phenols in resistant and susceptible genotypes of mungbean against mungbean yellow mosaic virus (MYMV) under field conditions. Ahmed et al. (2009) found that total phenol levels increased during the early stage of infection but later declined. Phenols may serve as defense compound against pathogen. (Sohal and Bajaj, 1993) reported earlier those phenols and sugars are responsible for disease resistance in different crops and resistant cultivar had more total phenols, flavanols and tannins as compared to those in the susceptible cultivar.

The investigation was undertaken during the spring season at Research Farm of Tirhut College of Agriculture, Dholi, Muzaffarpur, Bihar is situated in the humid subtropical zone. This study was thus undertaken to study the pattern of changes in the phenol content of resistant and susceptible plants in natural condition and to identify the compound that confers resistance to mungbean against this disease. The samples of mungbean leaves from HUM-16, TMV-37, Samrat and LGG 450 were collected at reproductive stages. The estimation of total phenol content protocol was carried out with Folin-Ciocalteu Reagent (FCR) by Bray and Thorpe 1954.Phenol reacts with an oxidizing agent phosphomolybdate in Folin- Ciocalteu reagent under alkaline condition. Formation of blue coloured complex, the molybdenum blueis measured at 650 nm wavelength in photocolorimetry instrument.

Chemicals used

1. 80 per cent Ethanol
2. Folin-ciocalteu reagent (FCR)

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3. 20per cent Na_2CO_3
4. Standard (100 mg catechol in 100 ml of water) diluted 10 times for marking standard.

1.0 g of fresh leaf sample of mungbean is weighted and ground in a pestle and mortar in 10-time volume of 80per cent ethanol. Homogenate it by centrifuged for 20 minutes, and supernatants are saved. The residue with five times the volume of 80per cent ethanol is re-extracted, centrifuged and the supernatants are pooled. The supernatant is evaporated up to dryness. The residue is dissolved in a known volume of 5 ml distilled water. Aliquots (0.1 to 1ml) are pipetted out into test tubes. Each tube is prepared up to 3 ml in volume with water.0.5 ml of Folinciocalteu reagent is added in each tube. After 3 minutes, 2 ml of 20per cent Na_2CO_3 solution is added to each tube. The tubes are mixed thoroughly and placed in boiling water for exactly one minute, cooled andthe absorbance is measured at 650 nm against a reagent blank in colour chromatography.

In Figure 1 , the relation between absorbance at 650 nm (au) and concentration of phenol (mg/g) of mungbean has been clearly shown to standardize the relation between the two parameters. The absorbance at 650 nm at 1mg/g concentration of phenol was 0.727 a.u. (Table 1 and Figure 1) This value was taken as standard as it is very close to the mean value. Standard curve is prepared using different concentration of catechol. The concentration of phenols is estimated through the standard curve in the test sample and expressed as mg. phenol/1g material.

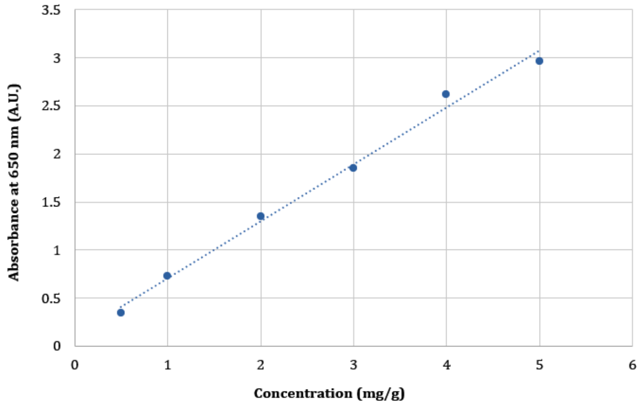

Fig. 1: Relation between phenol content and absorbance

Table 1: Value of phenol concentration and absorbance at 650 nm

Sl no.	Concentration of phenol (mg/g)	Absorbance at 650 nm (a.u.)
1	0.5	.339
2	1	.727
3	2	1.344
4	3	1.853
5	4	2.619
6	5	2.964

Highest value of Absorbance at 650 nm (a.u.) was found for TMV37 (0.909 a.u.) followed by HUM 16 (0.801a.u.) and Samrat (0.676a.u.) respectively. LGG 450 showed the least value of absorbance (0.574a.u.). Thus, highest value of Phenol concentration was calculated in TMV 37 (1.25mg/g), followed by HUM 16(1.10 mg/g) and Samrat (0.93mg/g) respectively. LGG 450 (0.79mg/g) showed the least phenol concentration. Results has been found in the same trends as Bhattacharya *et al* (2009) in relationship with shoot and fruit borer to egg-plant, Andreu *et al* (2001) in potato against *Phytophthora infestanes*, Anil *et al* (2018) and Tamilzharasi *et al* (2018) showed the effect of MYMV on mungbean.

Table 2: Estimation of total Phenols in four mungbean genotype

Sl. No	Geno-type	Absorbance at 650 nm (a.u.)	Phenol concentration (mg/g)	Resis-tance
1	HUM 16	0.801	1.10	Resistant
2	TMV 37	0.909	1.25	Highly Resistant
3	Sam-rat	0.676	0.93	Resistant
4	LGG 450	0.574	0.79	suscepti-ble

This experiment shows the direct relation between phenol concentration and absorbance at 650 nm. Also, it was found that the increase in phenolic concentration in the leaves of different mungbean genotypes increases the resistance to various pests and diseases. Whereas, decrease in phenolic concentration has the exact opposite effect. This clearly shows that the phenolic compounds have disease and pest resistant properties. TMV 37 and HUM 16 could be further used as parent in breeding programs for resistance from MYMV.

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