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Research Notes

STUDIES ON SOME ASPECTS OF BRONZING IN GUAVA (*PSIDIUM GUAJAVA* L)

A disorder manifesting in bronzing of guava leaves resulting ultimately in the total decline and death of the plant has been causing serious concern to guava growers. In bronzed plants, leaves initially develop purple to red specks scattered all over the leaf surface which later coalesce giving distinct bronze colouration. In more advanced stages, the trees start showing sickness through stunted growth and partially defoliated twigs and bronzed leaves. Fruits from severely bronzed leaves are characterized by brown coloured patches on the skin. Yields of affected trees are drastically reduced. In the present study, an attempt has. been made to find out the possible nutritional causes of bronzing in specific vulnerable areas of Karnataka state.

Systematic studies were conducted during 1979-81 through critical survey of gardens situated in different soil types. The survey included the affected guava gardens of the following categories:

1 Gardens severely affected by bronzing

2 Gardens moderately affected by bronzing

3 Healthy gardens

The characterisation of severely and moderately affected gardens was based on intensity of bronzing in the garden as a whole and its manifestation in the leaves. The severely affected gardens exhibited bronzing over 80 per cent not only in the individual leaves but also of the entire tree as made out visually. In moderately bronzed gardens, younger leaves showed scattered patches of bronzing symptoms. There were no visual symptoms of any kind of nutritional disorder manifested in the leaves of healthy gardens. Adopting these criteria, sixteen guava orchards in Bangalore and Kolar districts categorized under severely bronzed, moderately bronzed and healthy were selected for the study.

For characterizing the physico-chemical properties of soils of selected gardens, forty representative soil samples were taken from the above sixteen garden and analysed for pH, organic carbon, total nitrogen, available phosphorus, available potassium, exchangeable calcium and exchangeable magnesium as per methods described by Jackson (1958), DTPA extractable zinc and manganese were analysed as per the methods suggested by Black (1965).

For collecting leaf samples, eight trees each of severely bronzed, moderately bronzed and healthy were marked in each of the sixteen gardens. Five to six months old leaves located at 3rd and 4th node from the shoot tip were sampled from all four directions of the tree (Chadha *et. al.*, 1973). Forty samples, each

of 40-50 leaves taken from each tree were then analysed for nitrogen, phosphorus potassium, calcium, magnesium, zinc and manganese adopting the standard procedures.

Simple correlation coefficients between certain soil parameters viz., pH, organic carbon and available P_2O_5 with leaf nutrient values were computed.

Characterization of soils from affected guava gardens in Bangalore district revealed that the soils were sandy loam in texture with slightly acid in soil reaction. The organic carbon and total nitrogen were low indicating low fertility status of the soils of affected gardens (Tables 1 and 2). The available phosphorus content is too low and available potassium content is marginal to low with a range of 110.28 to 131.36 kg of K_2O/ha. The caicium and mangnesium content did not differ significantly between the gardens. The DTPA extractable zinc and manganese content also appeared to be adequate.

In Kolar district, the soils were relatively fine textured with alkaline soil reaction. Here also, soils were low in available phosphorus (12.10 kg / ha) and organic carbon (0.21 per cent). The soils of healthy gardens in Bangalore and Kolar districts showed that they are neutral to slightly alkaline in reaction and contained relatively higher organic carbon content of 0.59 and 0.50 per cent respectively. The plant available phosphorus and potassium were not only relatively in higher proportion compared to unhealthy gardens, but the contents of calcium and mangnesium were also high. Available zinc and manganese were also in adequate amounts. Drainage, however, was not a problem to cause sickness in these gardens. Thus the soil analysis data showed that the degree of bronzing viz., severe, moderate and healthy was closely related to the soil N, P and Zn status.

Healthy plants of both Bangalore and Kolar districts recorded the highest content of phosphorus 0,15 and 0.19 per cent respectively suggesting that low phosphorus content of leaves could be one of the factors promoting bronzing (Tables 3 and 4), Nutrient status of healthy leaves both in Bangalore and Kolar districts was better in respect of nitrogen, phosphorus, magnesium and zinc. Similar nutritional disorders in guava orchards in Dholka taluk of Gujarat state have been attributed to low concentrations of phosphorus and zinc in leaf tissues of severely affected plants (Mehta *et al.*, 1961). Since there were small variations of calcium and manganese in leaf tissues between healthy and bronzed trees their involvement in bronzing seems not possible. Comparing the values obtained in the bronzed leaf tissues of the affected gardens, it is evident that the nutrient status of the healthy gardens was far better than that of affected ones. Their uptake values in respect of nitrogen, phosphorus, potassium, magnesium and zinc were fairly high indicating good soil fertility status.

Table 1

Soil characteristics of guava gardens in Bangalore district (mean values)

State of health of tree	pH	Organic carbon (%)	Total N (%)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)	Exch. Ca (me/100g)	Exch. Mg (me/100g)	DTPA extractable Zn (ppm)	DTPA extractable Mn (ppm)
Severe bronzing	6.2	0.40	0.03	8.80	110.28	1.70	0.79	1.46	1.55
Moderate bronzing	6.2	0.46	0.03	13.50	107.78	2.92	0.90	1.62	1.99
Healthy	6.6	0.59	0.05	17.97	131.36	2.75	0.99	1.69	1.92
CD (0.05)	NS	0.09	NS	2.39	5.11	NS	NS	0.16	NS
SEm±	0.07	0.06	0.01	0.53	3.19	0.12	0.06	0.11	0.16

Table 2

Soil characteristics of guava gardens in Kolar district (mean values)

State of health of tree	pH	Organic carbon (%)	Total N (%)	Available P_2O_5 (kg/ha)	Available K_2O (kg/ha)	Exch. Ca (me/100g)	Exch. Mg (me/100g)	DTPA extractable Zn (ppm)	DTPA extractable Mn (ppm)
Severe bronzing	7.5	0.21	0.02	12.10	117.67	2.36	0.49	1.58	2.95
Moderate bronzing	7.5	0.31	0.04	11.77	119.10	2.41	0.76	1.59	1.79
Healthy	7.1	0.50	0.05	22.01	121.97	2.63	0.90	1.60	1.91
CD (0.05)	NS	0.11	0.01	4.13	5.99	NS	0.11	NS	NS
SEm±	0.15	0.02	0.01	0.99	2.18	0.07	0.02	0.24	0.54

Table 3

Leaf tissue nutrient status of guava gardens in Bangalore district (mean values)

State of health of tree	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Zn (ppm)	Mn (ppm)
Severe bronzing	2.58	0 08	0.81	1,11	0.56	146.61	49.91
Moderate bronzing	3.11	0.09	1.54	1.27	0.38	159.79	29.81
Healthy	3.64	0.15	1.04	0.99	0.59	260.99	36.19
CD (0.05)	0.81	0.02	NS	NS	0.02	21.11	5.21
S. Em ±	0.09	0,01	0.03	0.15	0.11	16.13	2.81

Table 4

Leaf tissue nutrient status of guava gardens in Kolar district (mean values)

State of health of tree	N (%)	P (%)	K (%)	Ca (%)	Mg (%)	Zn (ppm)	Mn (ppm)
Severe bronzing	2.88	0,05	1,30	1.74	0.40	124.82	54.72
Moderate bronzing	2.90	0.10	1.33	1.71	0.43	166.40	46.02
Healthy	3.71	0.19	1.03	1.69	0.56	285.00	43.11
CD (0.05)	0.71	0.04	NS	NS	0.11	40.11	NS
S. Em±	0,29	0.01	0.10	0.29	0.07	21.18	5.59

Table 5

Correlation coefficients for certain soil parameters (x) and leaf tissue constituents (y)

x	y	r
Severely bronzed gardens:		
pH	Nitrogen	-0.245*
,,	Phosphorus	-0.048
Organic C	Nitrogen	0.247*
,,	Phosphorus	0.436**
,,	Magnesium	0.248*
,,	Zinc	0.238*
Available P_2O_5	Phosphorus	0.311**
,,	Potassium	—0.319**
,,	Magnesium	-0.028
tt	Zinc	-0.255*

Moderately bronzed gardens:

PH	Nitrogen	—0.289*
,,	Phosphorus	—0.221
Organic C	Nitrogen	0.410**
,,	Phosphorus	0.299*
,,	Magnesium	0.103
,,	Zinc	—0.094
Available P_2O_5	Phosphorus	0.299*
,,	Potassium	—0.100
,,	Magnesium	—0.120
,,	Zinc	-0.308*

Healthy gardens:

PH	Nitrogen	-0.591*
,,	Phosphorus	-0.018
Organic C	Nitrogen	0.711**
,,	Phosphorus	0.513*
,,	Magnesium	0.518*
,,	Zinc	0.240
Available P_2O_5	Phosphorus	0.511*
,,	Potassium	0.060
,,	Magnesium	0.501*
,,	Zinc	—0.558*

* Significant at 5 per cent level

** Significant at 1 per cent level

Correlation coefficients worked out for some soil parameters and leaf tissue concentrations suggested good relationship (Table 5). Soil pH exhibited a fair degree of negative correlation with tissue nitrogen concentration. Soil organic carbon showed highest degree of correlation of 0.436 for P, and moderate degree with respect to N, Mg and Zn for severely bronzed leaves. For moderately bronzed leaves nitrogen and phosphorus contents of leaves showed high degree of correlation, while in healthy leaves, nitrogen, phosphorus and magnesium content of leaves showed a positive correlation with soil organic carbon. Available phosphorus content in soil exhibited high degree of correlation with leaf tissue content of P in all the gardens studied. It is noteworthy that available soil P content was negatively correlated with zinc at all stages of bronzing. The results of the present study give indications of the involvement of nutritional factors especially N, P and Zn deficiencies in the development of bronzing in guava.

സംഗ്രഹം

ബാഗ്ളൂർ കാർഷിക സർവ്വകലാശാലയിൽ നടത്തിയ ഒരു ഗവേഷണത്തിൽ പേര യിൽ കണ്ടുവരുന്ന കാംസ്യനം (bronzing) കേഷ്യ മൂലകങ്ങളുടെ അഭാവംകൊണ്ടാണോ എന്ന് നിരീക്ഷിക്കുകയുണ്ടായി. സാരമായും, മിതമായും കാംസ്യനം ബാധിച്ച തോട്ടങ്ങ ളിലെ മണ്ണിൽ ജൈവ കാർബൺ, നൈട്രജൻ, ലഭ്യമായ ഭാവഹം, ലഭ്യമായ സിങ്ക് എന്നീ മൂല കങ്ങളും തീരെ കുറഞ്ഞ തോതിലും പൊട്ടാസ്യം മിതമായ തോതിലും മാത്രം അടങ്ങിയിരി ക്കുന്നതായി കണ്ടു. കാ സ്യനം ബാധിച്ച ചെടികളുടെ പത്രകോശങ്ങളിൽ ഭാവഹത്തിന്റെയും സിങ്കിന്റേയും കാര്യമായ അഭാവം കാണുകയുണ്ടായി. പാകൃജനകത്തിന്റേയും, ഭാവഹത്തി ന്റേയും, സിങ്കിന്റേയും കുറവും ലഭ്യതയും കാംസ്യന കാരണങ്ങളും ആയേക്കാമെന്ന് ഈ ഗവേ ഷണ ഫലങ്ങളും സൂചിപ്പിക്കുന്നു. സാരമായും, മിതമായും കാ.സ്യനം ബാധിച്ച തോട്ടങ്ങ ളിൽ മണ്ണിലെ അമ്ളത (pH) പത്രങ്ങളിലെ നൈട്രജൻ, ഫോസ്ഫറസ് എന്നിവയുമായി വിപരീതമായും, ജൈവ കാർബൺ, ഇലകളിലെ നൈട്രജൻ, ഫോസ്ഫറസ്, മഗ്നീഷ്യം, സിങ്ക് എന്നീ മൂലകങ്ങളുമായി നേരിട്ടും ബന്ധപ്പെട്ടിരിക്കുന്നതായും കാണുകയുണ്ടായി.

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