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SHORT COMMUNICATION

DROUGHT TOLERANCE IN BLACK PEPPER (*PIPER NIGRUM* L.) CULTIVARS : AN EVALUATION OF PHYSIOLOGICAL PARAMETERS

S. VASANTHA, T. VARGHESE THOMAS, A. RAMADASAN AND T. JOHN ZACHARIAH

National Research Centre for Spices, P.O. Marikunnu, Calicut-673 012

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Under drought condition physiological parameters viz. stomatal diffusive resistance (rs), transpiration rate and leaf water potential were evaluated in black pepper cultivars under depleting soil moisture. Results indicate the utility of the above parameters in screening drought tolerant types in black pepper.

Black pepper (*Piper nigrum* (L.) is grown mainly in Kerala, where water deficit during off season viz., December-May is common feature. Drought is regarded as one of the constraints in increasing the productivily of black peper. Though literature is adundant on drought studies in perennial and plantation crops, research on black pepper is scanty. The importance of physiological parameters like stomatal diffusive resistance (rs), transpiration rate and leaf water potential (ψ L) is well documented in several research articles (Balasimha, 1988; Bawachkar, 1988; Crafts, 1973; Jones *et al.*, 1985; Rajagopal *et al.*, 1988). The present paper reports the utility of the above mentioned parameters in screening black pepper germplasm for drought resistance.

One year old vines of cultivars viz., Karimunda, Kottanadan, Neelamundi, Kuthiravally, Kalluvally, Arakulammunda, Aimpiriyan and Panniyur-1 were raised in cement tubs (50×70 cm), trained on teak poles. The experiment consisted of control and stress treatment of five vines each. The control plants were watered regularly so as to maintain the soil moisture content at field capacity (24% soil moisture content). Treatment was imposed in the other five plants by withholding irrigation. The experiment was conducted in open condition in the months of February and March, 1988 and 1989 during which there was no rain.

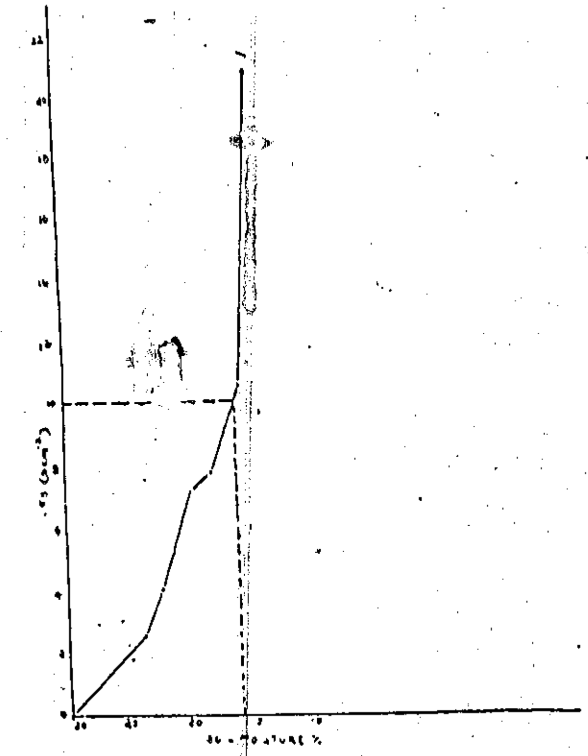

Fig. 1. Stomatal response curve for depleting soil moisture % in black pepper cultivars.

The soil moisture content was estimated by gravimetric method and soil samples were taken at 30 cm depth since effective root zone for black pepper is 30-40 cm. The rs and transpiration rate were recorded with a steady state porometer (LICOR MODEL 1600). Leaf water potential was recorded with the plant water status console Model 3015 of Soil Moisture Equipments Corporation. U.S A. The youngest fully opened mature leaf was used for the above observations.

The soil moisture content was depleted by 33% in stress treatment to that of control over a period of 20 days. The rs response to the depleting soil moisture levels is presented in Fig. 1, and this facilitated the determination of critical soil moisture (soil moisture % at half max of rs).

The data on rs, transpiration rate and ψL at critical soil moisture level are presented in Table I. Cv. Arakulammunda has shown highest stomatal resistance and least or nil transpiration, where metabolic activity in all probability is minimum or nil. Panniyur-1 showed lower rs and higher transpiration indicating its inability

Table I. Stomatal resistance (rs), transpiration and leaf water potential at critical moisture level

(rs : s cm^{-1}; μ gm cm^{-2} s^{-1}; L.W.P. : ψL—bars

Cultivar	Control (SMC : 23.6%)			Treatment (SMC : 16.7%)		
	rs	tr	ψL	rs	tr	ψL
Karimunda	2.95	7.98	5.80	6.03	4.50	8.20
Kottanadan	4.31	5.45	6.00	10.04	1.89	8.00
Neelamundi	2.15	10.57	5.80	8.06	2.63	8.90
Kuthiravally	3.67	5.69	6.80	6.35	2.48	8.40
Kalluvalli	5.15	4.45	5.60	12.30	2.08	7.20
Arakulam munda	5.95	3.89	5.80	22.05	0.13	16.00
Aimpiriyan	4.47	4.80	5.20	10.26	2.62	9.30
Panniyur-1	4.74	5.38	5.60	8.62	2.50	7.60

espond to the relatively severe stress. Cvs. Kalluvalli and Kottanadan showed atively high stomatal resistance coupled with lower transpiration rate over the

Leaf water potential ranged from —7.2 to —16.0 bars. Cvs. Arakulammunda owed highest ψL (−16 bars) and had shown visible wilting symptoms. Cvs. lluvalli and Kottanadan have shown lower leaf water potential comparable to trol which may be due to their active stomatal regulation whereby it had cut wn the transpiration drastically. However, stomatal regulation alone may not ely aid in combating drought, since black pepper is a perennial crop. Several er adaptations like leaf shedding, deeper root penetration etc. may play a role in drought resistance mechanism. The present study indicates that the pepper ltivars can be screened based on the parameters like rs, transpiration and leaf ter potential. Black pepper being perennial crop, evaluation of such screened ltivars in the field for drought tolerance is essential for confirmation.

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