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Wetting and rooting pattern of cocoa (*Theobroma cacao* L.) as influenced by drip and micro sprinkler irrigation

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ABSTRACT : A field experiment to study the influence of drip and micro sprinkler irrigation on wetting and rooting pattern of cocoa (*Theobroma cacao* L.) was conducted at the Department of Spices and Plantation Crops, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during January 2010 to December 2011. The wetting and rooting pattern was critically analyzed and the study revealed that the vertical movement of the moisture was higher than the horizontal movement in the drip irrigation system. When comparing drip and micro sprinkler irrigation, the surface rooting pattern in sprinkler irrigated trees indicated the same pattern as that of drip irrigation while, depth wise rooting pattern indicated that, 63 per cent of roots were present in the top 30 cm of soil and 17 per cent between 30 - 45 cm depth. In micro sprinkler irrigation, the active lateral roots were concentrated at surface of the soils (0 - 15 cm) and drip irrigation the roots are at 15 to 30 cm depth.

Key Words : Fertigation, Drip, Micro sprinkler, Water soluble fertilizers, Straight fertilizers, Wetting pattern, Rooting pattern

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Cocoa (*Theobroma cacao* L.) the 'Food of Gods' is one of the most important plantation crops consumed worldwide and around 40 - 50 million people depend on cocoa for their livelihood (World Cocoa Foundation, 2011). Cocoa is cultivated mainly in Africa, Asia, Central America and South America and major cocoa producing countries are Ivory Coast, Ghana, Indonesia, Nigeria, Cameroon, Brazil, Ecuador and Malaysia. The annual production is around 3 million tonnes with an estimated value of \$ 5.1 billion (World Cocoa Foundation, 2010). Ivory Coast leads in production occupying 38 per cent of total world cocoa production followed by Ghana (21 per cent), Indonesia (13 per cent), Nigeria (5 per cent), Cameroon (5 per cent), Brazil (4 per cent), Ecuador (3 per cent), Malaysia (1 per cent) and others (10 per cent). West Africa alone contributes nearly 70 per cent of the world cocoa production.

India offers considerable scope for cocoa cultivation, production and further development. Though cocoa has been known as the beverage crop even before tea and coffee, it is relatively a new crop to India. Cocoa is intercropped in coconut and arecanut and is a good companion to these crops. Four states viz., Kerala, Andhra Pradesh, Tamil Nadu and Karnataka share the major cocoa production in India. The current area is estimated to be 46,318 ha with production of 12,954 MT. The

national productivity is 550 kg dry beans per ha. Kerala leads in production with an area of 11,044 hectares contributing 6344 MT of cocoa beans with a productivity of 592 kg per hectare. Tamil Nadu occupies third in cocoa cultivation and the area reported under this crop is 15,000 ha with an annual production of 350 MT (DCCD, 2011).

More than 80 per cent of active roots in cocoa are located within the radius of 30-60 cm, surface application of the required fertilizers are to be applied between 30-60 cm distance from the main trunk under conventional system of irrigation.

In Tamil Nadu, a dose of 100:40:140 g NPK tree⁻¹ year⁻¹ is generally recommended (TNAU, 2004) for cocoa. The tap roots (1.2 m deep) in cocoa acts as physical support and only lateral roots (20 - 30 cm) absorbs the moisture and nutrients. As cocoa is very sensitive to moisture stress and water logging, irrigation should be at its optimum level for better growth. Hence, the present study was aimed to evaluate the fertigation system involving drip, sprinkler irrigation methods on wetting and rooting pattern in cocoa.

RESEARCH PROCEDURE

Field experiments were conducted at Department of Spices