

Effect of nozzle discharge rate and nozzle pressure on uniform deposition of spray

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■ **ABSTRACT :** Cotton is one of the principal commercial crops in India with 9.5 million ha cultivated area which is largest in the world. India is second largest producer of cotton in the world though the yield is only 300 kg/ha as against the world average of 558 kg/ha, due to poor control of insect pest and dry land farming conditions. During pesticide application most of the pesticide is lost through drift. A major reason for such a pesticide loss is insufficient nozzle pressure, nozzle discharge, nozzle height etc. Hence, it is necessary to determine the optimum discharge rate and pressure so as to reduce the pesticide losses from sprayer. Therefore, the hydraulic boom sprayer was tested using the spray scanner and droplet analyzer in the laboratory for cotton crop to study effect of nozzle discharge rates (0.45, 0.70, 0.90 and 1.35 l/min) and nozzle pressures (275.8, 413.7, 551.6 and 689.5 kPa) on spray uniformity. From the study it was found that nozzle discharge rate of 0.9 l/min and nozzle pressure of 689.5 kPa produced more uniform spray with droplet size of 122.53 to 284.80 μm , droplet density of 17 to 29 drops/cm² and uniformity coefficient of 0.99 to 1.23.

■ **KEY WORDS :** Boom sprayer, Spray scanner, Nozzle discharge rate, Nozzle pressure

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Cotton crop is concentrated in semi arid regions of the country. More than sixty per cent production is contributed by three states alone namely Gujarat, Maharashtra and Andhra Pradesh. Cotton is one of the principal commercial crops in India with 9.5 million ha cultivated area which is largest in the world. India is second largest producer of cotton in the world though the yield is only 300 kg /ha as against the world average of 558 kg/ha due poor control of insect pest and dry land farming conditions. Cotton plays an important role in the national economy providing large employment in the farm marketing and processing sectors. Although, there has been a significant growth in production, productivity and quality of Indian cotton during the last 50 years, it is way below the average world productivity and far below the general quality requirements.

A major reason for such a pesticide loss is insufficient nozzle pressure, nozzle discharge, nozzle height etc. Hence, it is necessary to determine the optimum discharge rate and pressure so as to reduce the pesticide losses from sprayer. Therefore, the hydraulic boom sprayer was tested using the spray scanner and droplet analyzer in the laboratory for cotton crop to study effect of nozzle discharge rates (*viz.*, 0.45, 0.70, 0.90 and 1.35 l/min) and nozzle pressures (*viz.*, 275.8, 413.7,

551.6 and 689.5 kPa) on spray uniformity.

■ METHODOLOGY

A 12 m tractor mounted boom sprayer (Table A) was selected for study and its performance was evaluated in the laboratory. The power for the operation of the boom sprayer was supplied by the power take-off (PTO) shaft of the tractor. The liquid distribution under a spray boom was measured with spray scanner. For spray deposition on cotton crop

Table A : Specifications of the boom sprayer	
Technical descriptions	Boom sprayer
Tank capacity	400 lit
Working pressure	689.5 Kpa
Maximum pressure	2758 Kpa
PTO rpm	540
Minimum hp required	35
Gross weight of sprayer	270 kg
Size of sprayer (L × W × H)	1364x1000x1212 mm
Application rate	580 lit/ha
Type and number of nozzles used	Plastic hollow cone, 25