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EFFECT OF CENTRIFUGAL BLOWER MOUNTED ON AIR ASSISTED SPRAYER IN THE ORCHARD FIELD

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Abstract: Orchards spraying mostly effective used as Air-assisted sprayers. In air carriers spraying system, air stream developed by a centrifugal blower is used as the medium to transport 100-200 μm droplets from the nozzles to the tree canopies. The centrifugal blower with forward curved blades was designed and fabricated to deliver the air 2 m³/s for 18 hp tractor. The blower having 28 blades, speed of operation 3.5 km/h and spray outlet distance 1500 mm combination was selected for the field evaluation. During the field evaluation, the droplet size was recorded as 164.67 μm and 151.33 μm . for outer canopy and inner canopy. The droplet density of outer and inner canopy was observed as 49.71 No./sq.cm, & 47.09 No./sq.cm. The effective field capacity for air assisted sprayer was observed 1.38 ha/h while theoretical field capacity was calculated as 1.75 ha/h. The field efficiency, fuel consumption was observed 79 % and 2.764 l/h respectively.

Keywords: Air assisted sprayer, centrifugal blower, droplet size and droplet density.

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INTRODUCTION

Air assisted sprayers is responsible for producing high volume and velocity airflow to transport liquid droplets from the nozzles to the trees. Blower is the main components in the air delivery system. The centrifugal blower was developed and tested at laboratory as well as at field. From laboratory evaluation the blower C having 28 blades, speed of operation at 3.5 km/h and 1500 mm distance combinations was selected for spray delivery outlet for field evaluation. During the field evaluation, the droplet size, droplet density, effective field capacity, field efficiency and fuel consumption was observed respectively.

Material and Methods:

A field test was conducted in sapota orchard at Aspee Agriculture Research Development Foundation Farm, Tansa. The relative humidity of 55 %; wind velocity from 1.0 to 1.6 m/s, wind direction from west to east and temperature from 24 - 32.5°C were recorded. The sapota field was 0.35 ha selected for field evaluation. The test field was divided into 24 plots of size 8 m x 8 m having each treatment replicated 3 times. Field experiment was conducted in CRD with 3 replications. The sprayer was operated at nozzle discharge of 1.8 lpm, pressure 100 PSI, spray delivery outlet distance 1500 mm between outlet and speed of operation at 3.5 km/h.

Results and discussion:

Droplet size(μm): The droplet size of air assisted orchard sprayer was determined in Sapota field. The droplet size measured on outer and inner canopy and at three different positions i.e. top, middle, bottom. The mean droplet size tabulated in table 1

Table 1 Droplet size on outer and inner canopy plant positions

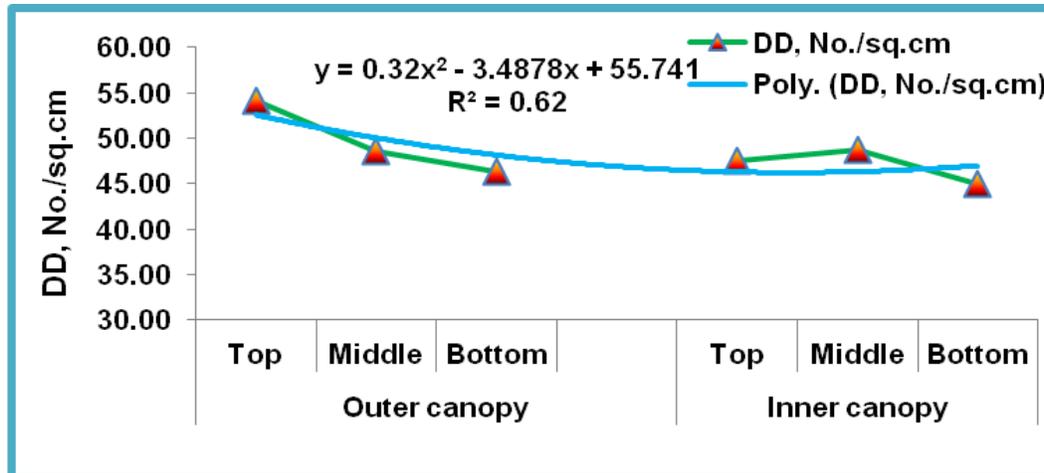
Droplet size VMD, μm					
Sr. No.	Plant Positions	Height			Mean
		Top	Middle	Bottom	
1	Outer canopy	164.22	176.00	153.78	164.67
2	Inner canopy	148.96	158.51	146.52	151.33
	Mean	156.59	167.25	150.15	
F Test		Sig.			
SE (m) \pm		1.3			
CD at 5 %		4.4			

Table 1 shows that the mean value of droplet size on outer canopy observed as 164.67 μm where as the mean value of droplet size on inner canopy was 151.33 μm . The minimum value of droplet size was observed as 146.52 μm obtained on inner canopy and at bottom position. The maximum value of droplet size was observed as 164.22 μm obtained on outer canopy and at top position. There was no significant difference observed amongst the mean values of droplet size.

Droplet density (DD, No./cm²)

The mean value of droplet density on outer canopy observed as 49.71 No./sq.cm whereas, the mean value of droplet density on inner canopy was recorded 47.09 No./sq.cm. The minimum value of droplet density observed as 45.04 No./sq.cm obtained on inner canopy at bottom position. The maximum value of droplet density was

observed as 54.17 No./sq.cm on outer canopy at top position which was followed by 48.74 No./sq.cm on inner canopy at middle position. There was no significant difference observed amongst the mean values of droplet density. Fig 1 shows the droplet density trend decreases in outer canopy with top, middle and bottom positions but in the inner canopy higher in middle than top & bottom positions



Field performance:

The field performance was carried out in the field of sapota crop. In the field performance, developed sprayer was operated 3.5 km/h. Its performances such as field capacity, field efficiency, fuel consumption and discharge of sprayer was calculated and recorded. The effective field capacity was observed 1.38 ha/h while theoretical field capacity was observed 1.75 ha/h. The field efficiency was observed around 79 per cent and fuel consumption was recorded 2.74 l/h.

Conclusions:

The average value of droplet density in laboratory was recorded as 58.6 No./sq.cm while it was 54.1 No./sq.cm in field. The droplet density was observed decreasing by 4.5 No./sq.cm when the blower was operated in the field with comparison of laboratory evaluation.

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