

Research Paper :

Use of constant pressure valve for manually operated Knapsack Sprayer

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ABSTRACT

The main concern in spraying is dose suitability, uniform distribution and optimum droplet size. The existing spraying devices like pump and diaphragm cannot meet the above spraying criteria. In order to overcome the difficulties arising due to pressure and flow variation, a new accessory called as constant pressure valve was designed and used. Constant pressure valve was tested with manually lever-operated sprayer in Aspee Research Institute Malad (W), Mumbai laboratory to find out its suitability in India condition. The set up consists of Aspee Hi-Tech sprayer (SRP-50) with hydraulic hollow cone nozzle (NMD/S 80 450) and 1 kg/cm² constant pressure valve. Constant pressure valve was tested at pressures 1,2,3,4 and 5 kg/cm². The observations were taken for discharge rate, spray angle, droplet size and volumetric efficiency of pump. It was observed that input pressure increased from 1 to 5 kg/cm² for discharged rate increased from 249 to 259 cc/min. Spray angle of 76° was always constant when pressure increased from 1 to 5 kg/cm². Droplet size (VMD) decreased 454 to 441 μm and NMD 234 to 216 μm with increasing same input pressure of 1 to 5 kg/cm². The volumetric efficiency of pump was in the range of 82.52 to 84.61 %.

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Protection of crops from insects, pests, diseases, and weeds has been the main concern of farmers after having grown it by using costly seed, fertilizer and water. With the advance of the pesticide application technology and the availability of information on it, the farmers interest in improvement of spraying quality has also increased considerably, both among big and small growers.

Knapsack sprayers are very widely used because of its simplicity in construction and operation besides flexibility in interchanging of the tips of the standard cone type nozzles, giving a wide range of spray outputs, pattern and quality at low cost.

However, due to the presence of the hydraulic pressurizing system like pump or diaphragm led to the wide variation in sprays pressure and flow which lead to the variation in discharge, non uniform pattern, distribution, droplet size and finally the less of spray material due to drift in wind. Contamination of operator clothes and body is yet another matter of concern.

In order to overcome the difficulties arising due to pressure and flow variations new accessory such as constant pressure valve was designed and used. Constant pressure valve was launched in order to improve the pesticides application quality by providing product saving amounting to approximately 20 per cent. It does not only gain or increase control over the pressure and flow but also maintain accurate and constant flow with predictable spray pattern and droplet spectrum, which ensure optimum

deposition.

METHODOLOGY

Experiments were conducted at Aspee Research Institute Malad (W), Mumbai. Aspee (SRP-50) lever operated knapsack sprayer was retrofitted with 1 kg/cm² constant pressure valve made of durable plastic and was easily adapted to Aspee knapsack sprayers fitting between the end of the lance and hydraulic nozzle (NMD/S 80 450). The detailed technical specifications of the knapsack sprayer used with 1 kg/cm² constant pressure valve are given in Table 1.

The constant flow valve delivers constant flow at the nozzle because of the unique design of the valve. It was attached to the lance of knapsack sprayers and gives constant flow rate from the nozzle regardless of changing input pressure at or above the pre-set operating pressure of constant pressure valve. It was with a view to find out the suitability of this valve retrofitted to an Aspee lever operated knapsack sprayer testing.

Testing included assessment of the quantity of spray solution and determination of the effect of pressure on atomization by the hydraulic hollow cone nozzle of its discharge rate, spray angle and spray droplet size. Laboratory testing procedure was done to determine discharge rate and number of strokes at different pressure with and without constant pressure valve. The sprayer was rigidly mounted on a test bench as desired with