

Knapsack Granular Fertiliser Dispenser



by Engr. Mohd. Fazly Mail

INTRODUCTION

Anyone who has grown a garden, maintained a lawn, or kept house plants knows that it is necessary to apply fertiliser to the soil to keep cultivated plants healthy. As they grow, plants extract nutrients they need from the soil. Unless these nutrients are replenished, the plants will eventually cease to grow. In nature, nutrients are returned to the soil when plants die and decay. However, this does not occur with cultivated plants.

Humans cultivate plants mainly for food, either for themselves or for livestock. When cultivated plants are harvested, the nutrients that the plants extracted from the soil are taken away. To keep the soil productive, it is necessary to replace these nutrients artificially. The type and amount of nutrients that plants need can be supplied by applying to the soil substances that contain these nutrients.

Proper application of fertiliser depends on the type of fertiliser you buy and the type of equipment you use. Traditional application of fertiliser utilises a lot of human labour, in which the fertiliser is placed in a bucket to facilitate the process. Fertilisers can be scattered by hand and raked in if gloves are worn, but this method is not very efficient or accurate. This method is not only tedious but also the amount of fertiliser is not evenly distributed often resulting in over or under-fertilisation of plants.

The practice of sowing fertiliser this way causes farmers to bear the weight of the bucket in one hand whilst bending at the waist to dispense the fertiliser. This causes a substantial burden on the body. To overcome this problem, farmers need to find a suitable position to distribute the fertiliser while carrying the bucket. In addition, this method requires the farmers to come into direct contact with chemical fertilisers. Only a small number of farmers wear gloves as a safety measure. Studies show that farmers feel uncomfortable wearing gloves, thus this situation can be detrimental to the health of the farmers, if it persists for long periods.

As a result, demand for a knapsack style fertiliser dispenser is in high demand from nursery operators, contractors and suppliers of oil palm plantations and indoor ornamental plants. However, most fertiliser dispensers in the market are designed for liquid fertilisers.

MACHINE DESIGN

Recognising this problem, a knapsack style instrument to dispense fertiliser has been designed by MARDI. This instrument is designed to overcome the uneven distribution of fertilisers to each tree. It is ideal for use on crops planted in polybags. It has a nozzle that allows the fertiliser to be placed directly into the polybag. This nozzle greatly improves the traditional fertilisation technique used by most farmers that require them to bend at the waist to distribute fertilisers into polybags.

This invention is generally designed to sow fertilisers accurately and quickly to crops (Figure 1). The amount of fertiliser applied is controlled by a metering hole on the device which can be changed according to the plant's needs (Figure 2). The prototype device is made of plastic to avoid being eroded by fertilisers. In addition, the design is simple and of relatively low cost to manufacture.

The equipment consists of a tapered container at the bottom, a precise metering mechanism, a hose, a long pipe and handle. When the handle is pushed down, it forces the fertiliser down through the outward holes, goes directly to the hose and pipe before it finally reaches the plant. It can distribute fertiliser accurately in amounts of 6g, 9g, 12g, 15g or 20g.



Figure 1: Knapsack Granular Fertiliser Dispenser

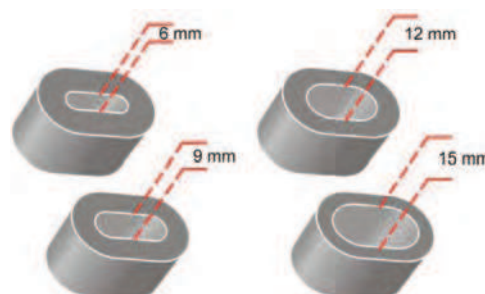


Figure 2: Rings to control the amount of fertiliser dispensed

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FEATURE

FINDINGS OF TRIALS

It was revealed that workers exerted less physical effort when the fertilisation of potted plants at the nursery was done using the knapsack fertiliser dispenser compared to the conventional method. Moreover, workers were not exposed to chemicals and could work safely (Figure 3). On top of that, the exact amount of fertiliser could be discharged for each tree (Figure 4). The time taken is similar to the manual method, but the uniqueness of this invention lies in its accuracy, as well as safety and user-friendly features.



Figure 3: Field test being conducted at nursery plots



Figure 4: Fertilisers being dispensed from the nozzle

The economic impact, potential uses or commercial potential of the dispenser are as follows:

- i) Affordable for smallholders to own.
- ii) The development of this instrument is indispensable for the food and agriculture industries to increase their efficiency and productivity.
- iii) Suitable for use by smallholders, contractors for small-scale plantations and operators of ornamental plant nurseries.
- iv) Applicable to rubber, oil palm and fruit tree nurseries.

CONCLUSION

The knapsack fertiliser dispenser performance satisfies all the design requirements and objectives of the study. This instrument is simple in design and construction, easy to use without causing back pain to the operator and is able to consistently dispense fertilisers to crops. ■

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