

Review Manually Operated Multi-Nozzle Pesticide Sprayer Pump

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ABSTRACT: Farmers are the heart of Indian culture. Over 70% of the rural household depends on agriculture as their principle mean of livelihood. The farmers comes under different levels according to their economic condition like small, marginal, medium and rich farmers. Small scale farmers always prefer manually operated instrument instead of developed instruments. In agriculture there are different filed work like weeding, reaping, sowing etc. Along these operations spraying pesticide is an preliminary operation performed by farmers. To protect them from insects, diseases, fungi and pests. Now a days number of technologies are used to spraying pesticide by using solar energy, electric energy and chemical energy. We can simply use mechanical energy instead of these energies and these saved energies can be utilised at appropriate place. Although using these developed instruments farmer suffer from different problems like less capacity of sprayer tank, less working area, more cost as compare to manual, more time consuming etc. To overcome these limitations number of product are launched in market, but they are not able to come over all the limitations at a time. We find a solution over all these limitation by developing Mechanically operated multi-nozzle sprayer pump for which any type of energy or fuel is not required except mechanical energy.

Motive of this paper is to generate a low cost sprayer pump for India's poor range farmers and reduce the required efforts. An accurate working model has been fabricated. It gives similar nozzle pressure and cover maximum area. We used crank mechanism along with piston pump, which is derived by rotation of wheel.

KEYWORDS: multi nozzle, livelihood, cost, time.

I. INTRODUCTION

Farming is the backbone of Indian economy. About 60 to 70 per cent of Indian population based on the field of agriculture and by a recent report they contribute 15 to 16 per cent to GDP. Agriculture is developed up to higher level in last 40 to 50 year. Out of the various reasons involved for this development is control of number of diseases on the plants. In the modern farming, the usage of pesticides is still increasing up to 80-85% of these pesticides are being applied on crops in the form of spraying which will maintain eco friendly approach. In Agricultural sector use of cheap and beneficial equipment for effective spraying for increase productivity which is very important for better contribution for India's GDP. The problem with using existing conventional equipment is that farmers will face economic difficulties in case of chemical and electrical powered pumps as well as they will face number of diseases and problem due to these spraying equipment's.

The best way to overcome all these problems is to use the equipment developed for application of the pesticide through the use of mechanical energy. In choosing a pump for supply of pesticides on crops, or for spraying insecticides, herbicides or fungicides we must be sure it definitely full fill our requirements. The unit should strong

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enough to supply the needed amount of water and spray material in the desired time. The principles of motion of trolley which transmit its rotary motion from chain and sprocket arrangement and reciprocating piston into the cylinder for pumping the pesticides which is used to the manually operated organic fertilizers cum pesticides sprayer. Generally used low cost Knapsack sprayer having major drawbacks as back pain and exertion of the user due to its heavy weight and manual pumping. Manually operated pumping are not constant they generate uneven pressure inside the spray cylinder. When Pressure in the tank fluctuates, it causes flow to become turbulent which is highly undesirable. When the pressure inside the cylinder increases, the width of spray increases, therefore causing the wastage of pesticides. In I C engine sprayer (Power Sprayers) uses an engine instead of manual operation.

The drawbacks include-The I C engine cause high vibrations, noise this could result in number of health problems. Due to heavy weight back pain causes. The tractor mounted sprayers are very expensive, not useful for small space and all type of crop. It suitable for heightened crop in large amount.

II. LITERATURE VIEW

Performance of a chemical injection sprayer system, found the time delay of concentrated pesticides through injection sprayers to be significant, and proposed injection at the individual nozzles as a possible solution to shorten delays. Development of a direct nozzle injection system that overcame the concentration variation problems reported by previous researchers. Simulation are used to compare chemical application accuracies for various designs of injection sprayers. They found that reducing the diameter of the fluid lines near the end of the spray booms improved overall application accuracy. An autonomous mobile robot for use in pest control and disease prevention applications in commercial greenhouses. They develop the robot platforms ability to successfully navigate itself down rows of a greenhouse, while the pesticide spraying system efficiently covers the plants evenly with spray in the set dosages. The main application of robots in the commercial sector has been concerned with the substitution of manual human labour by robots or mechanized systems to make the work more time efficient, accurate, uniform and less costly. The University of Nairobi develop the system like centrifugal pump is the most common non-positive displacement pump. The output from this type of pump is influenced by pressure. This pump is ideal for delivering large volumes of liquid at low pressures. key component of the centrifugal pump is the throttling valve. A manual throttling valve on the main output line is essential for the accurate operation of the centrifugal pump. The use of herbicides has replaced much of the mechanical tillage done formerly. Chemical application is done with attachments to tillage machines and seeder or with single-purpose chemical application.

III. SPRAYING METHODS

3.1] Knapsack (Backpack) Sprayer:

Operating principle of this is hand operated lever create a pressure difference in which pesticides and liquid is forced through nozzle in fine droplet form. The pressure of this sprayer approximately 7kg/sq cm. and capacity of storage tank is less than 20 liters. The components of backpack sprayer are lever, pump, tank, lance, boom and nozzle. This sprayer mainly cause back pain and fatigue to labour.

3.2] Hydraulic Sprayer:

It contains hydraulic nozzle it was mixed water and pesticide sprayed with atomize form. It is old technology still this used by most of farmers.

3.3] Tractor mounted equipment (Lite-Trac):

The Lite-Trac name comes from "lite tractor", due to the patented chassis design, facilitating the leaving machines manufactured by company to have lite footprint for mineral soil compression. This is Europe's largest lite tractor Manufacturer Company.

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3.4] Motorized Mist Blowers:

This motorized mist blower is designed and developed for spraying the pesticides on tall trees like cocoa capsids. This is also used to improve horizontal spray and penetration into crops.

5] CDA/ULV Application Equipment:

CDA means controlled droplet application and ULV means ultra low volume. Rotary nozzles are normally used to achieve to CDA. The reliable way of applying pesticides at ULV rate of application. This is hand-held cheap equipment and reliable.

IV. COMPONENTS OF MANUALLY OPERATED SPRAY PUMP

- 1) Frame
- 2) Piston pump
- 3) Roller shaft
- 4) Roller block
- 5) Slider
- 6) Chain
- 7) Drive sprocket
- 8) Driven sprocket
- 9) Nozzle

V. CONSTRUCTION

- Manually operated spray pump has simple structure it consist of a single wheel, piston pump, bearings, nozzle, shafts, trolley, pipe, crank shaft, handle chain drive, etc.
- There is trolley like structure containing pump on it and space for fitting the number of nozzle at certain height as per requirement.
- The rear wheels are connected by shaft. Bearings are provided at both sides for smooth motion.
- The wheel is connected to crank shaft by chain drive. The crank shaft is then connected to piston pump with connecting rod.
- The piston pump is placed middle of frame which has reciprocating movement.
- The nozzle is mounted on upper side of the tank. Nozzle having flexible pipe which is move or turn any direction. We can also adjust the height of the flexible pipe. We use 2 nozzles in our sprayer.

VI. WORKING

- First bring the spray pump at field where you want to use then fill the pesticides or water as your need.
- Then connect the chain drive to freewheel
- When we start applying/running the machine remembers to adjust the nozzle direction and height as per requirement.
- By holding handle when we start pushing the spray pump the wheels start to revolve due to its motion.
- The sprocket/freewheel transfers its motion to crank by chain drives the chain drive is connected to sprocket and crank.
- The crank shaft provides its motion to piston pump it. The pump works vertically reciprocating, through pipe the pesticides or water sprays on crop.

ADVANTAGES

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1. It can cover more area of land during spray.
2. It reduces the fatigue of operator during the operation.
3. It increases the efficiency of operator.
4. It can adjust the height of spray by using adjustable.
5. It does not require any kind of non-renewable energy is mechanical, electrical and pressure energy.
6. It has is less air pollution.
7. Its cost is less than electrically and solar operated pump.

DISADVANTAGES

1. For irregular crops this pump is difficult to work.
2. In rainy days in muddy environment it is difficult to operate.
3. In irregular area of land it can difficult to operate.

Table 1. Distances (horizontal & Vertical) and height of crop

Sr. no	Name of crop	Distance between Plants (horizontal/vertical)	Height of crop
1.	Sorghum	15 inch /3-4 inch	5.5-7 feet
2.	Pearl Millet	15 inch /3-4 inch	5.5-7 feet
3.	Sugarcane	15 inch /3-4 inch	5.5-7 feet
4.	Soybean	15 inch / 2 inch	5.5-7 feet
5.	Corn	15 inch /3 inch	5-7 feet
6.	Groundnut	15 inch / 3 inch	1.5 feet
7.	Cotton	24-36 inch /24-36 inch	2-5 feet
8.	Pigeon Pea	15 inches / 6 inches	3-4 feet



FIG.1 IMAGE OF MANUALLY OPERATED MULTI NOZZLE SPRAYER

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VII. CONCLUSION

- It covers twice area of spraying than manually spraying.
- More no. of nozzle which cover maximum area of spray in minimum time at maximum rate.
- The suggested model has removed the problem of back pain, since there is no need to carry the tank on the backbone and solder. The c.f. valves can also be applied which help in reducing the change of pressure fluctuation and c.f. Valves helps to maintain pressure.
- Proper adjustment facility in the model with respect to crop helps to avoid wastage of pesticide.
- The pump can deliver the liquid at sufficient pressure where output of the nozzle in 1 min is 0.3 and spray width 0.4m from calculation so that it reaches all the foliage and spreads entirely over the spray surface.
- It is little heavy but efficiently working in rough conditions of farm. It is economical therefore affordable for all kind of farmers.
- Excessive use of pesticides reduces which result into less pollution. Imported hollow cone nozzles should be used in the field for better Performance.
- Muscular problems are removed and there is no need to operate the lever.
- This alone pump can used for multiple crops.
- It is cost effective than the existing spraying pumps available in the market as no direct fuel cost or cost for maintenance is needed for this.

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