

Trolley Encompassed Pesticide Sprayer

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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 farmer 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 field works like weeding, reaping, sowing etc. Along these operations spraying pesticide is an preliminary operation performed by farmers, to protect them from insects, fungi, pests and diseases. Now a day's numbers 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 utilized at appropriate place. Although using these developed instruments farmers suffer from different problems like less capacity of sprayer tank, less working area, more cost as compared 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 'TROLLY ENCOMPASSED PESTICIDE SPRAYER'

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 recent report they contribute 15 to 16 per cent to GDP. Agriculture is developed 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

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with using existing conventional equipment is that farmers will face number of diseases and problem due to these spraying equipments.

The best way to overcome all these problems is to use the equipment developed for application of the pesticides through the use of mechanical energy. In choosing a pump for supply of pesticides on crops, or for spraying herbicides or fungicides we must be sure it definitely fulfill our requirements. The unit should strong enough to supply the needed amount of water and spray material in the desired time. The principles of motion of trolley encompassed pesticide sprayer is to spray the liquid evenly according to the pressure required through the entire surface. 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. The tractor mounted sprayers are very expensive, not useful for small space and all type of crop. Its suitable for heighted crop in large amount.

PROBLEM STATEMENT

Existed pesticide sprayer is heavy and hard to carry. Next, the sprayer that nowadays farmer use to spray their farm take so much time for them to finish spraying. After that, existed poison sprayer is less efficient because only provided with one host and one nozzle to spray. Farmers need to directed the nozzle straight forward to the plant. Then, farmers need to bend them back a little bit when they want to start spraying their farm. They need to bend a little bit because want to carry up the sprayer that is heavy that can cause strain to their back. In addition, only can load with not large amount of water, pesticide, herbicide.

LITERATURE REVIEW

Plastic knapsack sprayer:

16 liters knapsack sprayer are conventional and most popular equipment used worldwide. They are ideal for spraying insecticides, pesticides, fungicides, herbicides etc. in field

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areas to protect the crop from pest attack. This sprayer has multiple applications and are widely used in agriculture, horticulture, sericulture, plantations, forestry, gardens etc

Knapsack sprayer

This sprayer is suitable for applying chemical to several field crops. The operator carries the sprayer on his back and it has a fat tank of 10- 16 litres capacities. The hydraulic pump fitted inside the tank for operate the pump, agitator filter, delivery hose and nozzle. When pump is operated, fluid through the suction hole and delivery to cut lever before through the nozzles.

Typical hand sprayer

Typical hand sprayer can be fill with at least one gallon of liquid. Usually use for small scale of garden or farm or for spraying flower at house.

Power operated duster

Power operated duster mainly consists of a power driven fan, a hopper and a delivery spout. The fan creates strong air flow which causes the dust to blow off from the hopper to a considerable distance vertically or horizontally. Direction of dust is regulated by a movable suitably fitted the unit. This type is used for large area like the paddy.

Pressure water

It is a heavy and effective sprayer and requires an engine to operate the power sprayer. It consists of a triplex pump with stainless steel piston with oil bath lubrication. It can develops 250 to 350 pounds and can deliver the solution up to 15m. The pressure needs to use a long hose to do the spraying and cost for this sprayer is very expensive.

DISADVANTAGES OF CONVENTIONAL METHOD:

- This type of machine is in the type of back pack so it is very difficult to the operator to operate this machine for long time.
- The time consumption for the spraying process is high.
- Incomplete spraying is done over the crops because it consists of single spraying nozzles.
- High manpower is required to operate this machine.
- Operation cost is high.
- The spraying nozzles are nearest to the operator, so the operator is affected by the pesticides.
- This sprayer could not operate for a long time because it is back pack type the entire weight is lifted by human.
- Due to back pack type operator is affected by lumbar pain.

NEEDS FOR ENHANCEMENT OF PESTICIDE SPRAYING PROCESS:

- As most of the pesticide spraying process required human power to operate the machine, this will lead to causing some harmful effect to human like lumbar pain, breathing problem, eye irritation. And most of the machine is in back pack type which is lifted by human, it lead to lumbar pain for the operator.

- These methods will consume high operation cost, high manpower, and high time consumption, harm full to human. In this method incomplete spraying process is done over the crops, so this method will reduce the profit of the framers. In this method trolley is used to overcome those problem faced by the operator and farmers and complete spraying is done over the crops.

TROLLEY ENCOMPASSED PESTICIDE SPRAYER

DEFINITION:

Trolley encompassed pesticide sprayer is the method of spraying the pesticide in an easy way with the help of trolley. In this method the complete spraying is done over the crops. The entire equipment is encompassed in the trolley, so it is easy to transport the machine in between the crops.

ADVANTAGES OF TROLLEY ENCOMPASSED PESTICIDE SPRAYER:

- In trolley encompassed pesticide sprayer complete spraying is done over the crops.
- This machine is easy to transport between the crops.
- The height of the spraying nozzles can be changed based on the crops height.
- The angle of the spraying nozzles can be changed, so that side way spraying can be done over the crops.
- Less time is consumed by this machine for spraying process then compare to conventional method.
- Manpower can be reduced by using this machine.
- Less operation cost is needed to operate this method then compare to other conventional methods.

ADJUSMENT OF SPRAYING NOZZLES:

HEIGHT ADJUSTMENT:

Based on the growth of the crops, every crop will not grow at the same height. Different crop will grow at different height. If the spraying nozzles are fixed at a particular height we could not able to spray for higher crops and it is very difficult to spray for small crops also. So height adjustment is very necessary to spray different height of plant.

In our setup the height of the nozzles can be varied between 30cm to 100cm.



Fig 1
HEIGHT ADJUSTMENT

- Portable power sprayer holding frame.
- Wheel holding set up.
- Tank holding set up.
- Height adjustment set up.
- Angle adjustment set up.
- Handel.
- Resting stand.

COMPONENTS USED IN THE SCHEMATIC SETUP:

The components used in the present experiment are mention below:

1 SQUARE PIPES:

Square pipes are used to make the entire experiment, this is made up of a mild steel. The cross section of the square pipe is 20mm and the thickness is 2mm.

2 CIRCULAR PIPES:

Circular pipes are used to make the height adjustment setup, two pipes of diameter 20mm and 25mm is used, the thickness of the pipes is 2mm.

3 PLATES:

Plates are used to make power sprayer support and tank support, mild steel plates are used in our setup, the width of the plate is 40mm and the thickness of the plates is 2mm.

4 PORTABLE POWER SPRAYER:

Portable power sprayer is used to supply pesticide liquid from the storage tank to the spraying nozzles with high pressure, it is operated between the pressure of 1mpa to 2.5mpa. This pressure difference is done by using a gear pump which is driven with the help of 2 stroke S.I engine.



Fig 3
PORTABLE POWER SPRAYER:

5 SPRAYING NOZZLES:

Spraying nozzles is used to spray the pesticide liquid over the crops. The pressurized pesticide liquid which comes out from the power sprayer is feed into the spraying nozzles to spray the pesticide over the crops. This nozzles is made up of steels, there are three spraying nozzles is fixed on the pipe.

ANGLE ADJUSTMENT:

The angle of the spraying nozzles can be changed to spray the crops in side surfaces. This setup is help us to spray the wider plants because if we spray the pesticides from wider plants from top the pesticide will not completely sprayed over the plants at middle and bottom of the plant, so incomplete spraying is done. To overcome this problem we should spray the plants in side way, this could be done only by changing the nozzles.

In our setup the nozzles angle can be change in four different angle they are 0°, 30°, 60° and 90°.



Fig 2
ANGLE ADJUSTMENT

EXPERIMENTAL SET-UP

PROPOSED INNOVATION:

It is proved fact that in our method the efficiency of spraying process is increased with the help of the trolley, because all the equipment and components that is used for the spraying process is encompassed in the trolley. So trolley is designed in a way to increase the efficiency of the pesticide spraying process and should be easy to handle.

DESIGN OF TROLLEY:

Trolley is design in a way to hold the power sprayer, storage tank and other equipments on it. To move the trolley from one place to other place it is necessary to make a wheel holding set up in the trolley. Trolley is made using a square pipe which is made up of mild steel.

The following set up is made in the trolley;



Fig 4
SPRAYING NOZZLES:

6 PESTICIDE LIQUID STORAGE TANK:

Tank is used to store the pesticide liquid, the capacity of the storage tank is 30 liters but for the safety purpose we can store up to 20 liters.



Fig 5
PESTICIDE LIQUID STORAGE TANK:

7 WATER HOSES:

Water hoses is used to transfere the water from the tank to the pump and pump to the nozzles, three different hoses are used in the setup

- FEED HOSE:

Feed hose is used to transfere pesticide liduid from the tank to the pump

- PRESSURE HOSE:

Pressure hose is used to transfere pressurized liduid that comes out from the pump to the spraying nozzles.

- OVER FLOW HOSE:

Over flow hose is used to transfere the excess liquid to the tank which comes out from the pump.

8 WHEEL:

In our setup single wheel is used to transport the trolley. The rim size is 18x1.6, and the tyre size is 18 x 2.75. the rim is made upof steel.



Fig 6
WHEEL

11. OVEALL TROLLEY DIMENSION

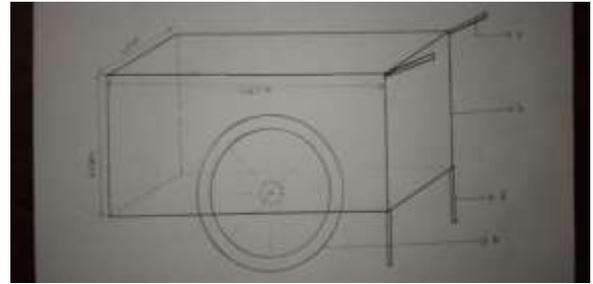


Fig 7

- ❖ Length of the Trolley 105 Cm
- ❖ Width of the Trolley is 45 Cm
- ❖ Height of the Trolley is 45 Cm
- ❖ Resting Stand Height 30Cm
- ❖ Ground Clearance is 30Cm

Trolley Encompassed Pesticide Sprayer



Fig 8 Trolley Encompassed Pesticide Sprayer

12. PROCESS OPERATION

In this method pesticide spraying process involves, at first the pesticide liquid is stored in the tank, then the portable power sprayer is started then the pesticide liquid which is stored in the tank is flow to intake of the pump through the flow hose. The pesticide liquid is get pressurized by the gear pump then the pressurized liquid is passed to the spraying nozzles through the pressure hose. The excess pesticide liquid which comes out from the over flow port of the pump is directed to the tank with the help of overflow hose. The pressure of the spraying can be controlled by adjusting the flow control valve which is located at the pump.

PERFORMANCE ANALYSIS

We make an experimental result between Battery sprayer, power sprayer and Trolley Encompassed Pesticide Sprayer, based on spraying one Acre by considering the time consumption, number of labours required, total number of rows sprayed

S.No	Machine used for spraying process	Time taken for spraying one Acre in Minutes	Total numbers of Labours required	Maximum number of rows sprayed in single walk
1	Battery Sprayer	35 Minutes	4	1
2	Power Sprayer	25 Minutes	4	2
3	Trolley Encompassed Pesticide Sprayer	15 Minutes	2/3	4

- ❖ The amount of Pesticide Liquid consume is depend upon the growth of the plant

COST ANALYSIS

S. No.	Subject of Expenditure	Expenditure (in Rupees)
1.	Cost of Square Pipe	Rs.690/-
2.	Cost of Circular Pipes	Rs.250/-
3.	Cost of Flat & L-Shaped Plates	Rs.200/-
4.	Cost of Storage Tank	Rs.1000/-
5.	Cost of Wheel	Rs.2000/-
6.	Cost of Axle Rod & Bushes	Rs.160/-
7.	Cost of Portable Power Sprayer	Rs.10000/-
8.	Cost of Spraying Nozzles	Rs.2000/-
9.	Cost of Nuts, Bolts & Washer	Rs.200/-
10.	Cost of Labor & Machining	Rs.4000/-
11.	Cost of Painting	Rs.1500/-
12.	Other Expenditure	Rs.3000/-

Total Cost = Rs.25000/-

Total cost spend to Design and Fabricate the Trolley Encompassed Pesticide Sprayer is up to Rs.25000/-

OBSERVATION

Finally we observed that, "Trolley Encompassed Pesticide Sprayer" will be more efficiency then compare to the conventional methods like Battery sprayer and Power sprayer. By using our machine farmers can gain more profits and also they can reduce the time consumed for pesticide spraying process.

Even the labors required to operate the machine is equal to the conventional methods but they can complete a wide coverage of land then compare to the conventional methods.

CONCLUSION

Thus trolley encompassed pesticide sprayer proves a promising source to achieve a complete spraying over the crops, less time consumption and operation cost is also lesser

than compare to the conventional methods. The arrangement of the trolley will increase the efficiency of the pesticide spraying. The initial cost of the machine is also approximately equal to the conventional sprayers but when we compare with conventional sprayers, trolley encompassed pesticide sprayer is advanced one because the performance is good. The effort to the operator is reduced then compare to the conventional method. Thus in this method the operator will not affect by harm full diseases like skin disease, breathing problem, etc. Finally by using trolley encompassed pesticide sprayer, we can reduce manpower, time consumption, operation cost and effort for the operator is also reduced, thus complete spraying is also done over the crops.

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