

Design and Fabrication of Agricultural Sprayer

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ABSTRACT

India is a land of agriculture which comprises of small, marginal, medium and rich farmers. Small scale farmers are very interested in manually lever operated knapsack sprayer because of its versatility, cost and design. But this sprayer has certain limitations like it cannot maintain required pressure; it lead to problem of back pain. This paper suggests a model of manually operated multi nozzle pesticides sprayer pump which will perform spraying at maximum rate in minimum time. We have designed a model running without any fuel and also easy to operate for a user. We tries to develop a new mechanical system which will overcome all the above problems and will help farmers to.

INTRODUCTION

Mostly in India we used the old method and equipment for the agriculture. For agriculture the pesticide and water is mostly required after the some interval of time to remove the insect from the agriculture land. In old equipment only one work has been performed at a time due to which the time as well as effort required is more. The agriculture field being small, automation in such places are a difficult task also the economic condition of majority of Indian farmers is not well to do. Therefore, the manually operated sprayer finds wide application in such condition. In Indian farms two types of sprays are used: Hand operated and Fuel operated pump.

India is a land of agriculture which comprises of small, marginal, medium and rich farmers. Small scale farmers are very interested in manually lever operated knapsack sprayer because of its versatility, cost and design. But this sprayer has certain limitations like it cannot maintain required pressure; it lead to problem of back pain. However this equipment can also lead to misapplication of chemicals and ineffective control of target pest which leads to loss of pesticides due to dribbling or drift during application. This phenomenon not only adds to cost of production but also cause environmental pollution and imbalance in natural echo system. This paper suggests a model of manually operated multi nozzle pesticides sprayer pump which will perform spraying at maximum rate in minimum time.

In Normal Spray pump work on electrical battery operated or using manpower to operate lever for spraying pesticides. In Push operated spray pump a one trolley is there in which specially mechanism for translating rotary motion into reciprocating motion this reciprocating motion used to operate the pump lever. This lever operate pump increase the pressure of pesticides and pesticides will be sprayed. It is a device which is used to sprinkle pesticides without more efforts.

Spraying of agrochemicals in the field is a tedious and laborious task. The conventional knapsack sprayers available in the market require manual labour to operate, which is difficult to find due to movement of farm

labours toward cities. The small farmers cannot afford to buy the power operated sprayer or tractor-mounted sprayers available in the market, as these are very costly and are of not much use to small farmers due to small land holdings.

Agriculture sprayer pesticide machine is designed to reduce human effort. It used to agriculture field by spray pesticide. Now day's farmer more used pesticide in farm to get better crop. Agricultural spray adjuvants are used with pesticides order to enhance such as insecticide, fungicides and other agents that control or eliminate unwanted pests.

II.LITERATURE REVIEW

[1] India is predominantly an agricultural based country with approximately 75% of population of India is very much dependent on farming either directly or indirectly. The farmers have been using the same methods and equipment for ages for example the seed sowing, spraying, weeding etc. operations are carried out by same techniques. There is need for development of an effective spraying machine for increasing productivity levels. Most of the late developing countries of Asia have the problem of higher population and low levels of land productivity as of compared to the developed nations. One the main reasons for lower productivity is insufficient power availability for the farms and very low levels of farm mechanization.

Agricultural equipment's and machinery programme of the governments has been one of selective mechanization with a view of optimising the use of human, animal and other source of power. In order to meet requirements, steps are taken to increase availability of implement, irrigation pumps, tractors, power tiller, combine harvesters and other power operated machines and also for to increase the production and availability of improved animal driven implements. Special emphasis was given on the later as more than the 70% of the farmers fall in small and, marginal categories.

[2] 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 research's. 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.

[3] While much of modern agriculture is based on mass mechanized production, advances in sensing and manipulation technologies may facilitate precision autonomous operations that could improve the crop yield and quality while saving energy, reducing manpower, and being environmentally friendly. Agriculture is the backbone of human civilization. It evolved with human history whereas in the righteous book; Al-Quran there are verses of agriculture significance invariably in many societies agriculture integrates into various socio-religious practices. Refer to Imam Nawawi on Kitab Sahih, the best work or effort for the human being is agriculture.

III.OBJECTIVE

- 1] To reduce the overall cycle time for agricultural sprayer.
- 2] Unskilled operator should handle easily.
- 3] Easy to assemble and disassemble.
- 4] Should be affordable.
- 5] Highly durable.
- 6] Multi nozzles is used and hence large area of field can be spread at a faster rate
- 7] To reduce human efforts due to the constant pumping action for creating pressure inside the pesticide sprayer and there by provide suitable environment for the user reducing the fatigue load acting on the body.

IV.PRESENT SITUATION

The hand operated sprayer generally used by farmer involves continuous pumping by one hand while holding the sprayer with the other. The whole process of spraying is thus very tiresome and also leads to hand, back and neck pains with prolonged use for any scale of operation with heavy backload. Also this device requires a lot of time to cover the more area which increases cost for spraying as well as hazard of pesticide mist getting into the eyes. Manual labour has also scare due to migration of farm labourers towards cities. Other options like two wheel mounted and tractor mounted sprayers, are too expensive and not of much use in small holdings.



V.PART LIST

- Knapsack sprayer
- Chain
- Bearing
- Eccentric disk
- Sprocket

- Bicycle Wheel
- Pump

VI. PARTS DESCRIPTION



Figure 1: knapsack sprayer

1 Knapsack sprayer

- Capacity :-15 litre
- Pressure:- 0.2-0.5Mpa
- Net Weight:- 6.2 kg
- Size:- 36*18*5

2 Sprocket



Figure 2: sprocket

The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth.

3 Eccentric disc

According to the stroke length of the piston the eccentric hole is drilled, from the centre point of the disc.

Diameter of the disc-10mm

Thickness-10mm

The eccentric hole is drilled 4cm from centre of the disc. The total stroke length is 8cm.



Fig 3: Eccentric disc

4. Chain

Chain is kinematic element which is used to transmit the power between two gears without slip and zero energy loss. It is used to connect between bigger and smaller sprocket without any slip.

5. Pump

The pump system comprise of sprayer mechanism of 3 litre capacity integrated with An inbuilt pump and sprayer. During the upward motion of the piston fluid is sucked in and pressurised into pressure vessel and during downward movement the sucked fluid cross the plunger and enter the pump.



Figure 3: Pump & Assembly Model

VII.SPECIFICATION

Sr.No	Part name	Dimensions (in mm)
1	Sprocket rear wheel	105
2	Sprocket rear teeth	32
3	Crankshaft length	175
4	Ball bearing diameter	45
5	Bearing no.	620
6	Disc diameter	110
7	Connecting link length	615
8	Stroke length	30
9	Chain length	1080
10	Wheel diameter	660
11	Wheel rim diameter	580
12	Wheel axis length	170
13	Drive sprocket	200
14	Drive sprocket teeth	63 (teeth)
15	Crankshaft bearing housing	45
16	Pipe thickness	26
17	Water storage tank height	370
18	Water storage tank width	325
19	Water storage tank thickness	130
20	Water storage tank capacity	15 lit.
21	Adjustable rod length	680
22	Adjustable rod outer diameter	12
23	Adjustable rod inner diameter	4
24	Nozzle rod diameter	10
25	Spray pipe maximum length	2450
26	Spray pipe length	1000
27	Spray pipe diameter	3
28	Spray rod length	1600

VIII.VALIDATION

Validation of final working model :- Product given to farmer some days they fill the pesticide with clean water & moving the full unit pesticides on the plant . As the copmparision between the traditional sprayer and developed sprayer it covers the maximum area of crop.

Sr.No.	Parameters	Single sprayer	Developed sprayer
1.	Nozzle	1	4
2.	Time	2 hrs./acre	30 min./acre
3.	Covered area	Minimum	Maximum
4.	Effort	More	Less
5.	Operator fatigue	More	Less
6.	Cost	Low	Medium
7.	To operate	Difficult	Easy

IX.CONCLUSION

While conclusion this paper we fill file quite contended in having completed the project assignment well on time we had enormous practical experience on fulfil of manufacturing schedule of working project module we are therefore happy to state the calculations of mechanical aptitude proved to be very useful purpose agriculture pesticide sprayer is designed to reduce human effort is used to agriculture field by spray pesticide now a days farmer more used pesticide in farm to get better crop.

The motive behind developing this equipment is to create mechanizations which will help to minimize effort of farming.It is suitable for the spraying at minimum costs for the farmers so that; he can afford it of the many product available. Also we will reduce the operator fatigue and cover the maximum area within minimum time as compare to single sprayer.

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