

SUCCESS STORIES

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All India Coordinated Research Project on
FARM IMPLEMENTS AND MACHINERY
Central Institute of Agricultural Engineering
Nabi Bagh, Berasia Road, Bhopal - 462 038, India

Extension Bulletin No.CIAE/FIM/2008/80

Year : 2008

Published by : Coordinating Cell
AICRP on Farm Implements and Machinery
Central Institute of Agricultural Engineering
Nabi Bagh, Berasia Road
Bhopal-462 038, India

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Published by	:	Central Institute of Agricultural Engineering Nabi Bagh, Bhopal-462 038, India
Printed at	:	M/s Drishti Offset MP Nagar, Zone-1, Bhopal-462 011

2. Tractor Operated Aero-blast Sprayer

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Introduction

Cotton is one of the principal commercial crops in India with about 9.0 million-hectare areas in 2004-05. About 76% of this area is rainfed. India is the third largest producers of cotton in the world with average yield of 404 kg/ha as against the world average of 558 kg/ha. The cotton production is 13.6 million bales, cottonseed of 5 million tonnes, and cotton stalks of 15 million tonnes. The annual production of cottonseed oil is 0.45-0.47 million tonnes. Cotton plays an important role in the national economy providing large employment in the farm marketing and processing sector. All textiles including cotton contribute to about 33% of Indian export.

Cotton is cultivated in three distinct agro-climatic zones. North zone comprising Punjab, Haryana and Northern Rajasthan. Central zone comprising Maharashtra, Gujarat and Madhya Pradesh and South Zone comprising Tamil Nadu, Karnataka and Andhra Pradesh. Central Zone contributed 57.5% of total cotton production in the country. Cotton is sown in India during March to September and harvested during September to April. Now India grows all types of cotton i.e. Asiatic, American, Egyptian types and hybrids.

The farm machine has great potential for its introduction in the cotton crop growing area, because as many as 6-7 sprays are required for complete control of insects. Tractor operated sprayers damage the crop, which comes under chassis especially when the crop is tall. On the other hand, aero-blast sprayer will result in low crop damage and hence contribute towards increase in yield. Also, by introduction of this sprayer the farmer's having large orchards may be benefited. The problem of spraying on cotton, sunflower & horticultural trees will also be solved by the introduction of this machine. The area under these crops may also increase with introduction of this machine. Because of high capacity of this machine, this may also promote custom hiring.

Brief description of the machine

Aero blast sprayer is useful for spraying on horticultural trees and tall crops like cotton, sunflower etc. It is mounted on 3-point linkage of the tractor and is operated by tractor PTO. The machine is comprised of a 400 litre capacity tank and spraying nozzles to release the pesticide solution into stream of air blast produced by the centrifugal blower. The air blast distributes the chemical in the form of very fine particles throughout its swath width, which is on one side of tractor. The major

portion of swath width is taken care of by the main blast through the main spout and the supplement nozzles cover the swath area near the tractor. Other parts of the machine are pump, fan, control valve, filling unit and spout adjustment handle. Brief specification of the machine is given in Table 2.1.

Details of sub units of aero blast sprayer

1. Pump: The pump mounted on the sprayer has high flow rate ranging from 110 to 150 litres/min.
2. Fan: The sprayer is equipped with a high capacity centrifugal blower to produce air blast that helps to distribute the chemical in form of very fine particles throughout its swath width.
3. Flow rate regulation valve: It helps to regulate the flow rate ranging from 8.0 to 25.0 l/min at different lever settings of 0.5 to 4.0.
4. In-Line-Filter: The sprayer is equipped with two in-line filters, one for main spout and one for the auxiliary rotary atomizer. These filters have 80 mesh-size capacities and optimize the filtering of the chemical mixture that flow to the nozzles.
5. Spout: It is easily adjusted both vertically and horizontally to suit the crop/tree height. As the adjustment handle is located in a convenient position to the tractor drive, it can be adjusted even during the operation.
6. Nozzles: The job of the nozzles is to generate droplets and distribute them uniformly over the area being sprayed.
7. Tank: The 400 litre tank is provided for filling the chemical.

Table 2.1: Specifications of Tractor Operated Aero Blast Sprayer

S. No.	Particular	Dimensions
1.	Source of power	Tractor of 35 hp and above
2.	Type of power drive from tractor to machine	Tractor PTO at 540 rpm
3.	Crops for which machine is suitable	Cotton, Sunflower, tall crops and horticultural trees
4.	Type of pump	Centrifugal (single motor)
5.	Flow rate, litres/min	120
6.	Spray swath, m	15 (without wind) 25-30 (with wind at 5-10 km/h)
7.	Fan speed, rpm	3630
8.	Working speed, km/h	2-6
9.	Tank capacity, litres	400
10.	Machine weight, kg	230
11.	Machine cost, Rs.	1,00,000/-

Evaluation Procedure:

Large-scale field trials were carried out on the aero blast sprayer. Also, most of farmers used this machine on cotton and sunflower crops. The data like tank filling capacity, plant damage etc. were recorded. Numbers of farmers who have purchased the machines are mostly using it on cotton. Few farmers are using it on orchards trees. Demonstration of aero blast sprayer during field day to the farmers is shown in Fig. 1. The survey was also done on the machine purchased by the farmers. They were also assisted. Data at farmers field during feasibility trials was recorded. The data recorded at university farm is given in Table 2.2.

Results and Discussion:

Machine performance results in Table 2.2 reveals that it can cover about 1.5 ha/h at research trials where as it goes up to 2.5 ha/h at farmers field. The speed of operation varied from 1.5 to 1.75 km/h. The fuel consumption was observed always more than 6 lit/h. The cost of operation of aero blast sprayer is 550 Rs./ha. The list of farmers along with their comments is given in Tables 2.3, 2.4 and 2.5. Area indicated in the Table includes 6-7 number sprays on cotton on same area.



Fig. 2.1: A view of tractor operated aero blast sprayer.

Table 2.2: Field performance results of aero blast sprayer.

Parameters	R1	R2	R3	Mean
Time taken to cover 50 m/s	120	122	125	122.3
Speed of operation, km/h	1.5	1.45	1.51	1.48
Time taken to cover 2000 m ² ,min	8.06	8.54	9.20	8.6
Field capacity, ha/h	1.48	1.51	1.53	1.50
Amount of water used, lit/ha	210	200	215	208.3
Plant damage	Negligible			
Tank filling time, s	28	30	28	28.66

Table 2.3: Details of the use and purchase of Aero blast Sprayers by the farmers.

S. No.	Name & Address of the farmers	Machine availability purchased/ hired	Year of purchase	Average area covered per year, ha	Farmers comments
1	S. Nachhatat Singh S/o. Swaran Singh Vill. Middu Khera Block Lambi, Mukatsar	Purchased on subsidy	1997	250	Very much satisfied with the machine performance. Servicing is poor. Weight of machine is more.
2	S. Tajinder Singh S/o Sh. Gurnam Singh Vill. Middu Khera Block Lambi, Mukatsar	Purchased without subsidy	1996	300	Very much satisfied With the machine performance. Servicing is poor.
3	S. Paramjit Singh S/o S. Balraj Singh Vill. Bhai Ka Khera Block Lambi, Mukatsar	Purchased without subsidy	1997	220	Very much satisfied with the machine performance. Weight of machine is more.
4	S. Harpal singh s/o. S. Daram Singh Vill. Khera Block Lambi, Mukatsar	Purchased on subsidy	1999	54	Spray is not uniform.
5	Boota Singh S/o. Gianoor Singhh Vill. Mahne, Block Lambi, Mukatsar	Purchased Without subsidy	1998	800	Total weight is more. Performance is Satisfactory.
6	S. Maninder Singh S/o. S. Giandoor singh Vill. Bhai ka Khera Block Lambi, Mukatsar	Purchased without subsidy	1997	308	Machinery performance is satisfactory. Total weight is more.
7	Sh. Ram Swaroop Vill. Bariwale Mukatsar	Purchased without subsidy	1994	1000	Very good machine.
8	S. Gurmeet singh Vill. Udaikaran Mukatsar	Purchased without subsidy	1996	-	Machine returned to company. Not satisfied.
9	S. Tej Singh Vill. Bhagsar Mukatsar	Purchased without subsidy	1996	252	Very much satisfied. No. problems at all.
10	S. Sevaraj Singh Vill. Bhagsar Mukatsar	Purchased	1997	300	Very much satisfied. No problems at all.

Table 2.4: Farmers using Aero-blast sprayers purchased through subsidy scheme in Punjab.

S.No.	Name of the farmers and Address	Purchase Price (Rs. In Lakh)	Average area sprayed per day(ha)	Fuel consumption (l/h)	Breakdown, if any
1	S. Nachata Singh, Vill. Middu Khera Block Lambi, Mukatsar	1.2	20-24	5-6	Fan belts, leakage of hoses
2	S. Tejinder Singh Vill. Khera, Block Lambi, Mukatsar	1.25	40	4.0-4.5	No
3	S.Taj Singh & S.Darshan Singh Vill. Khera, Block Lambi,Mukatsar	1.3	16	4-5	Main shaft & Bearings
4	S. Rajwant Singh & S.Jagwant Singh Vill. Khera Block Lambi, Mukatsar	1.3	16-20	5-6	Fan belt
5	S. Hardwinder Singh & S. Paramjit Singh Vill. Bhai Khera Block Lambi, Mukatsar	1.35	16-18	4-5	Line out of Pulleys
6	S. Maninder Singh, Vill. Bhai Khera, Lambi, Mukatsar	1.3	16-18	4-5	No
7	S. Khuswant Singh, Vill. Khera Block Lambi, Mukatsar	1.3	28	6-7	No
8	S. Major Singh, Vill. Haku wala, Lambi, Mukarsar	1.3	10.4	5	No
9	S. Shamsheer Singh Vill. Kuttian wali, Lambi, Mukatsar	1.3	16-18	4-5	No
10	S. Tej Singh, Vill. Bhagsar, Mukatsar	1.45	20-32	6	Cross, Belts
11	S. Narinder Singh, Vill. Bhagsar, Mukatsar	On hire from Agency	20	4-5	Cross, spline Shaft

		@Rs. 37.5/ ha/spray			
12	S. Shivraj Singh & S. Iqbal Singh Vill. Bhagsar, Mukatsar	1.2	12	7-8	Belt
13	S. Sukinder Pal Singh, Vill. Gallu Khuian, Server, Ferozepur	1.3	12	4-4.5	Belts
14	S. Surinder Pal Singh Village Tungwali, Nathana, Bathinda	1.3	9	3-4	Belt, Atomizer
15	S. Bhoora Singh, Vill. Kot sameer, Talwandi Sabo, Bathinda	Hired from UPL@ Rs. 62.5/ha	20	-	No
16	S. Surjeet Singh, Kot sameer, Talwandi sabo, Bathinda	1.3	-	-	Cross
17	S. Jaswant Singh Toor, Lohar Khera, Sardulgarh, Bathinda	1.3	20	4-5	Belt, cross

Table 2.5: Farmers using aero blast sprayer on Horticultural crops.

S. No	Name of farmer	Land holding/ land under orchard, ha	Purchase price (Rs. In lakh)	Average area sprayed per day (ha)	Fuel consumption (l/h)	Breakdown, if any
1.	Mr. Udai Pal Gudara, Vill. Bishan Pura, Balluana, Ferozepur	80/20	2.0	20	4-5	No.
2.	Mr. Vikas Rai, Vill. Nihal Kher, Khuian Server, Ferozepur	24/24	1.95	24	5	Excessive Vibrations

Some of the salient features of aero blast sprayer is given in Table 2.6.

Table 2.6: Salient features of aero blast sprayers.

1	Extent of achieving timeliness of operation and contribution of the equipment in enhancing productivity through timeliness of operation	Spraying can be done timely as 30-40 ha of spraying can be done in a day. Helps to increase yield by way of better insect & Pest control.
2	Improvement in quality of work	Better control of insects
3	Reduction of drudgery	Human drudgery is greatly reduced in comparison to knapsack sprayers
4	Improvement in safety	Minimizes chemical contact with humans/User
5	Cost effectiveness	Not much but quality of work is better

Farmers Comments:

- 1) The farmers are satisfied with the performance of the machine.
- 2) The main breakdown were observed in cross, pulleys and belt.
- 3) Service of the supplier was very poor.
- 4) The cost of machine is high.
- 5) Weight of machine is higher and some times from end of tractor lift.
- 6) Maximum farmers, who are using this aero blast sprayer, have land holding more than 20 ha. This sprayer is suitable for larger land holdings as it has high field capacity and high price.
- 7) Average swath width observed from survey varied from 17 to 20 m. Its swath width is greater than any other spraying equipment.
- 8) Most of the farmers purchase this machine by availing subsidy of Rs. 50,000/- provided by the government.
- 9) Only 30% of the farmers were provided after sale service by the manufacturer for proper operation of the aero blast sprayer.
- 10) Most of the farmers (more than 85%) were not satisfied with the after sale service provided by the manufacture.
- 11) About 90% farmers were satisfied with the performance of this sprayer due to its high swath width and high field capacity.

- 12) The breakdowns and failures observed were of belts (25%), bearing (20%), filter (10%), pipes (10%), chocking (15%) of filter, loosening of belts (30%) etc. These breakdowns were mostly due to excessive use and wearing and tearing during operation, excessive heat generation and load in the belts.
- 13) More than 80 percent of chemical goes into air.
- 14) Purchase price of aero blast sprayer as reported by the farmers varied between 1.20 to 1.45 lakhs depending on the year of purchase. Most of the farmers availed subsidy
- 15) Average area sprayed was reported to be as high as 28 ha and low as 9 ha/day. Most of farmers do not want custom hiring.

Annexure - I

List of Manufacturers

1. Gursukh Agro Works
Vill. Jhakroudi, P.O. Samrala
Ludhiana – 141 114
2. ASPEE Group of Companies
Aspee House, BJ Patel Road,
Malad (W), Mumbai – 400 064
3. Birar Equipments
Plot No. B-21, Street No. 4
Nasik Industrial Co-op Estate
Satpur, Nashik – 422 007
4. Kisan Blower Udyog
Kikwari (K), Taluka Satara
Dist. Nasik
5. Pyara Singh & Sons, Samrala, Distt. Ludhiana.