Testing and Training Center of Farm Machinery
(Approved by Govt. of India)
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JAU/CAET/FMP/ RKVY/ 973 /2021
Junagadh. Date: 27/5 /2021

To
Shreeji Agro Industries
Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer,
Wankaner-363 621, Dist. Morbi (Gujarat)

Sub.: To release "Test Report"

Ref.: Your application dated 26/02/2021

With reference to above cited subject and referred application for the testing of **Tractor Operated Trailed Type Power Sprayer Shreeji-Jet Vikrant",** please find attached herewith the "Test Report" of the same.

Testing Incharge
and Professor & Head

Encl.: As above

COMMERCIAL TEST REPORT

No.: TTCFMJ/D/179/1016

Date of Report: 27/05/2021

This Test Report valid up to Date: 26/05/2028

TTCFM-FMPE-CAET
JAU-JUNAGADH-362001 (Gui.)

TRACTOR OPERATED TRAILED TYPE POWER SPRAYER
"SHREEJI-JET VIKRANT"

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Name of machine	:	**Tractor Operated Trailed Type Power Sprayer "Shreeji-Jet Vikrant"**
Test requested by (Applicant)	:	**Shreeji Agro Industries** Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer, Wankaner-363 621, Dist. Morbi (Gujarat)
Manufacturer	:	**Shreeji Agro Industries** Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer, Wankaner-363 621, Dist. Morbi (Gujarat)
Testing Authority	:	Testing & Training Center of Farm Machinery Department of Farm Machinery & Power Engineering College of Agricultural Engineering & Technology Junagadh Agricultural University, Junagadh (Gujarat)
Type of test	:	COMMERCIAL
Test Code /Procedure	:	IS:11313-2007, 3652-1995 (Amended), 8548-2004, 4468-2001 (Part-I), 4931-2006
Test Report No.	:	TTCFMJ/D/179/1016
Date of Release	:	**27/05/2021**
This Test Report valid up to Date	:	**26/05/2028**

1. The data given in the Test Report pertain to the particular machine submitted for test. The data collected during the test do not in any way attribute to the durability of the machine.
2. The results reported in this report are observed values and no corrections have been applied for atmospheric and site conditions.
3. The Test Report contains only performance data/ parameters obtained for a particular sample. However, this do not communicate/signify the approval/ recommendation of the Govt. of India or the Testing Authority for any Govt. programmes or otherwise.
4. This Test Report should not be reproduced in part or full without prior permission of the Testing Incharge, Testing & Training Center of Farm Machinery, College of Agricultural Engineering & Technology, Junagadh Agricultural University, Junagadh (Gujarat).

SELECTED CONVERSIONS

Sr. No		Units	Conversion Factor
1	**Force**	1 kgf	9.80665 N
			2.20462 lbf
2	**Power**	1 hp	1.01387 metric hp (Ps)
			745.7 W
		1 Ps	735.5 W
		1 kW	1.35962 Ps
3	**Pressure**	1 psi	6.895 kPa
		1 kgf/cm^2	98.067 kPa = 735.56 mm of Hg
		1 bar	100 kPa = 10 N/cm^2
		1 mm of Hg	1.3332 m-bar

C O N T E N T S

1. SCOPE OF TEST

Test scope of the test was to check and assess the following:

1) General :
   a) Checking of specifications
   b) Checking of material
2) Short run test:
   a) Discharge rate
   b) Spraying width
   c) Pump efficiency
   d) Mechanical vibration
   e) Visual observation
3) Long run test:
   a) Wear of nozzle
   b) Visual observations

2. METHOD OF SELECTION

The sample is directly submitted by the manufacturer for test at the Center in pursuance of the Office Memorandum F. No. 13-13 /2020 - M&T (I&P), Dt. 24/04/2020 of Dy. Commissioner, Dept. of Agriculture, Cooperation and Farmers Welfare, M&T Division, Ministry of Agri. & Farmers Welfare, Govt. of India, New Delhi regarding exemption from random selection of test sample. Hence, method of selection is not known. This test report is not covered under BIS certification. Therefore, the applicant cannot mark the sprayer under ISI certification mark.

3. TEST PROCEDURE

The following test codes were referred:

1) IS:11313-2007, Hydraulic power sprayers- Specification
2) IS:3652-1995 (Amended), Crop protection equipment – Foot sprayer – specification
3) IS: 8548-2004, Test code for power operated hydraulic sprayer
4) IS:4468-2001 (Part-I), Agricultural wheeled tractor - rear mounted three point linkage
5) IS:4931-2006, Agricultural tractor- rear mounted power take off types 1, 2 and 3

4. SPECIFICATIONS

4.1 General

a)	Name	:	Tractor Operated Trailed Type Power Sprayer
b)	Type	:	Hydraulic power sprayer pump
c)	Make	:	Shreeji
d)	Name of manufacturer	:	Shreeji Agro Industries Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer, Wankaner-363 621, Dist. Morbi (Gujarat)
e)	Name of applicant	:	Shreeji Agro Industries Panchasar Road, Nr. Shreeji PVC Pipe, Opp. Shreeji Power Transformer, Wankaner-363 621, Dist. Morbi (Gujarat)
f)	Serial Number	:	20/21002
g)	Model	:	Jet Vikrant
h)	Size (mm)	:	1000 litre
i)	Suction capacity (lit/min)	:	60 (as per applicant)
j)	Year of manufacture	:	2020-21
k)	Recommended source of power as per applicant	:	Tractor (15 hp and above), Brief specification of tractor used is given in **Annexure-I**.

4.2 **Constructional Details (Refer Fig. 1):**

4.2.1 **Main frame / Chassis:**

a) Type and material : Rectangular type, MS rectangular pipe/plate

b) Size of material (mm) : Pipe (100x50, 50x50, 25x25), Plate (6)

c) Overall size (mm) : 1800 (l) x 705 (b) x 1030 (h)

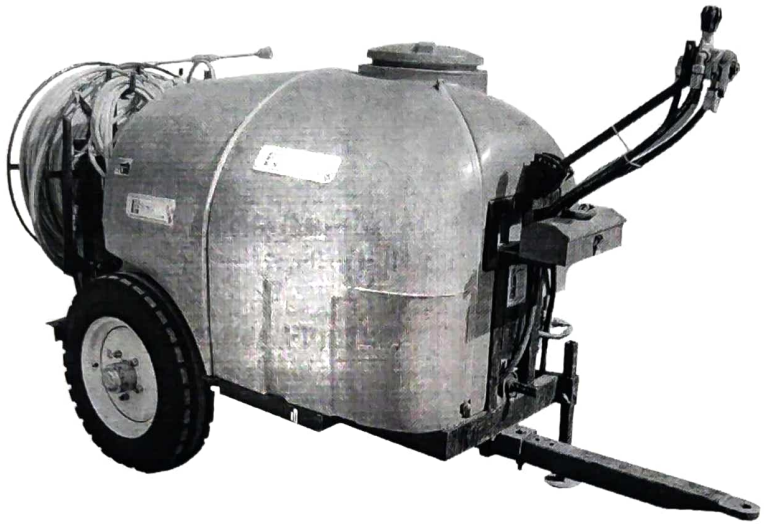


Fig. 1: Schematic view of Tractor Operated Trailed Type Power Sprayer

4.2.2 **Pump:**

a) Type, make and model : Horizontal Triplex Power (HTP) / Piston or plunger type, Victor CA-S51

b) No. of piston or plunger : 03

c) Inner dia. and stroke length of piston or plunger (mm) : 32.0, 32.0

d) Rated (Recommended) pump speed for spraying (rpm) : 800 (as per applicant)

e) Suction volume (Discharge capacity) at rated pressure (l/min) : 60 (as per applicant)

f) Max. working (achievable) pressure (kg/cm^2) : 50 kg/cm^2 (1 bar = 1.019 kg/cm^2 = 100 kPa) (as per applicant)

g) Rated (Recommended) working pressure (kg/cm^2) : 10 kg/cm^2 (as per applicant)

h) Pressure gauge capacity (kg/cm^2) : 0-106 (0-1500 psi)

i) Pump power requirement (kW) : 3.0-7.0 hp (as per applicant)

j) Pump weight (kg) : 16.2

4.2.3 **Spray gun:**

a) Make and model : PMT

b) Length of gun (mm) : 630

c) No. and type of nozzle provided on gun : 1, Hollow cone (1-hole)

4.2.4 **Tank:**

a)	Make and model	:	Shreeji
b)	Material	:	PVC
c)	Capacity (l)	:	1000
d)	Overall size (mm)	:	1500x1050x1010 (with groove)

4.2.5 **Agitating device** : There is no specific agitator provided. However, the overflow discharge of the pump is agitating the mixture in the tank.

4.2.6 **Mechanism for Auto reel for spray pipe/delivery hose:**

a)	Type and material	:	Circular type, MS round/flat
b)	Size of material used (mm)	:	MS round 16 Ø, flat 25x6
c)	Size of reel (mm)	:	900 Ø
d)	Method of power transmission to this mechanism	:	Propeller shaft takes drive from PTO shaft of tractor and transmits to reel mechanism through Clutch assembly which is directly fitted between PTO to intermediate pulley (125 Ø) to reel pulley (600 Ø) and get powered by Belt-Pulley mechanism fitted on MS shaft (1900x35 Ø) supported on 4 nos. (P-207) bearings.
e)	Capacity of reel (m)	:	300 m of spray pipe (as per applicant)

4.2.7 **Spray pipe/delivery hose:**

a)	Type and material	:	Flexible, PVC
b)	Length (m) and dia. of pipe (mm)	:	300, 18.0 /10.0 Ø (OD/ID)

4.2.8 **Type of hitch and its details / Transporting arrangement:**

a)	Type	:	Towing
b)	Dimensions (mm)	:	MS sq. pipe (75x75, 5 thick, 1305 length)
c)	Wheel equipment	:	
	-Nos. and type of wheels	:	2, Pneumatic ribbed
	-Make and model	:	MRL tyres
	-Size	:	6.00x16.00, 10 PR
	-Inflation pressure (kg/cm^2)	:	2.50
	-Nos. and type of bearings	:	2 taper roller bearing
d)	Hitch hook	:	
	-Size of hook (ID) mm	:	32.0
	-Height of hook from ground level (mm)	:	330 (adjustable)

4.2.9 **Power transmission system:**

a)	Method of transmission	:	Propeller shaft takes drive from PTO shaft of tractor and transmits to pump through chain and sprocket drive.

b) Type : Chain and sprocket drive
c) Number of teeth on drive sprockets : 24
d) Number of teeth on driven sprocket : 15
e) Speed ratio from drive to driven sprocket : 1.00:1.60
f) Speed (rpm) of pump corresponding to 540 rpm of the tractor : 864

4.2.9.1 **Splined end of sprayer input shaft (Refer Fig. 2):**

Dimension of Implement Power Input Shaft As per IS: 4931-2006

Specification/ Notations (Refer Fig. 3)	Dimensions as per IS: 4931-2006	Dimensions as observed	Remarks
PTO Type 1/2/3	Type-1/2/3	Type-1	Conforms
Nominal speed (rpm)	540/1000/1000	540	Conforms
Nominal dia.(mm)	35/35/45	35	Conforms
Number and type of splines	6- straight splines/21 involutes/20 involutes	6, straight splines	Conforms
Dimensions (mm)			
D Φ	34.79±0.06	34.84	Conforms
d Φ	28.91+0.05, -0.15	29.92	Conforms
B Φ	29.40±0.1	29.41	Conforms
A Φ	8.3±0.1 (optional)	Not provided	--
W	8.53-8.60	8.60	Conforms
a	7	7	Conforms
b	25±0.5	--	--
c	38	38	Conforms
x	30°	30°	Conforms
B	76 (min)	86.70	Conforms

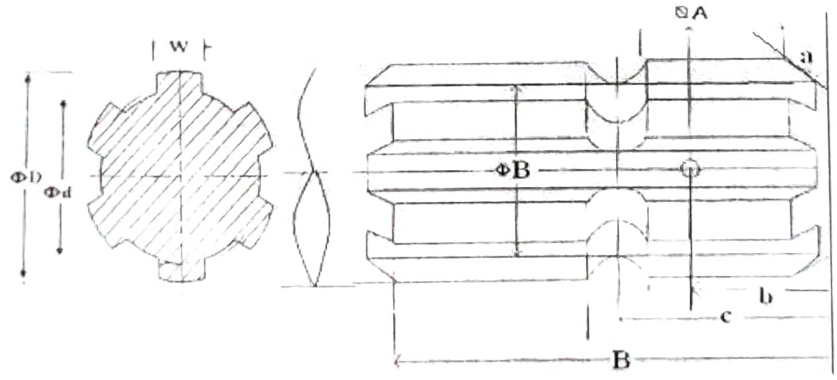


Fig. 2: Dimension of Implement Power Input Shaft

4.2.9.2 **Propeller shaft (Refer Fig. 3)** :

a) Type and material : Telescopic (with two segment) having one universal joint on each segment with splined ends to insert the PTO of tractor and main drive shaft (MS 1900x35 Ø supported on 5 nos. P-207 bearings) of pump.
b) Length of shaft (mm) : 790 (Minimum), 915 (Maximum)
c) Mass of shaft (kg) : 19.5
d) Provision for locking : 2 spring loaded shear pins on both sides

Propeller Shaft Insert Dimensions As per IS: 4931-2006

Sr.	Notations (Refer Fig. 3)	Dimensions as per IS: 4931-2006	Dimensions as observed	Remarks
1	D Φ	34.93±0.03	34.93	Conforms
2	d Φ	29.70±0.1	29.72	Conforms
3	W	8.69 (min)	9.30	Conforms
4	B	54 (min)	62.71	Conforms

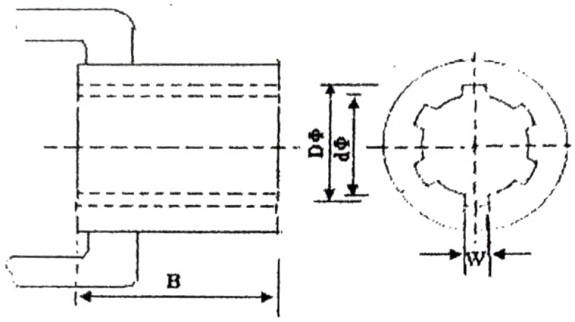


Fig. 3 : Propeller Shaft Insert Dimensions

4.3 **Overall Dimensions (mm):**

a) Length : 3000
b) Width : 1220
c) Height : 1660
d) Mass with all accessories and without chemical, (kg) : 460.0
e) Mass with all accessories and with chemical, (kg) : 1460.0 (approx.)

5. CONFORMITY TO INDIAN STANDARDS

Hydraulic power sprayers- Specification (IS: 11313-2007)

Cl.	Specified requirement as per Indian standards	Observation	Remarks
1	2	3	4
4	**MATERIALS:**		
4.1	The recommended material for the construction of various components is given in Table 1.		

Table 1

Sr. No.	Components	Materials	Observations	Remarks
1	2	3	4	5
1	Pump cylinder	Brass, Stainless steel	Stainless steel	Conforms
2	Pressure chamber	Brass, Stainless steel	Brass	Conforms
3	Piston rod	Stainless steel	N.A.	--
4	Piston or plunger	Gunmetal, Stainless steel, Plastics, Rubber, Vegetable tanned leather, Chrome tanned leather	Stainless steel	Conforms
5	Spreader	Brass, Stainless steel, Plastics	Brass	Conforms
6	Valve assembly	Brass, Stainless steel, Plastics	Stainless steel	Conforms

7	Roller pump shaft	Stainless steel	N.A.	--
8	Pump rollers	Nylon filled with lead	N.A.	--
9	Pressure regulator	Brass, Stainless steel	Brass	Conforms
10	Suction strainer	Brass, Stainless steel, Plastics	Plastics	Conforms
11	Strainer body	Brass, Plastics	Plastics	Conforms
12	Gasket	Rubber, PVC, Leather, Fibre	PVC	Conforms
13	Spray nozzles	Brass, Stainless steel	Brass	Conforms
14	Spray boom	Mild steel, Galvanized iron, Braided rubber	N.A.	--
15	Hose	Synthetic rubber, PVC	PVC	Conforms
16	Tank	Galvanized iron, Brass, Fibre glass reinforced plastics, Plastics	Plastics	Conforms
17	Pipe for agitator	Galvanized iron, Brass, PVC	PVC	Conforms
18	Piston (bucket) screw	Brass, Stainless steel	Brass	Conforms
19	Crank case	Aluminum alloy	Aluminum alloy	Conforms
20	Roller pump body	Nickel resistant cast iron	N.A.	--
21	Roller pump and plate	Nickel resistant cast iron	N.A.	--
22	Roller pump motor	Nickel resistant cast iron	N.A.	--
23	Piston pump crank shaft	Carbon steel	Carbon steel	Conforms
24	Pump inlet port end fitting	Brass	Brass	Conforms
25	Piston rod guide	Brass, Aluminum alloy, Gunmetal, Nylon	N.A.	--
26	Connecting rod	Carbon steel	Carbon steel	Conforms
27	Gudgeon pin	Carbon steel	Carbon steel	Conforms
28	Big end bearing	Steel coated with tin base	Steel coated with tin base	Conforms
29	Small end bush	Gunmetal	Gunmetal	Conforms

Cl.	**Specified requirement as per Indian standards**	**Observation**	**Remarks**
4.2	All metallic parts in coming in contact with the pesticide should preferably be of the same material to minimize bimetallic corrosion.	All the parts coming in contact with pesticide are made from same material.	Conforms
4.3	The material used for different components shall be declared by the manufacturer. All the components mentioned in the Table 1 may not be present in a particular sprayer.	Not declared by the manufacturer.	Does not conform
5	**CONSTRUCTION REQUIREMENT:**		
5.1	The **tank**, if provided, its capacity shall be not less than 100 litres. The tank capacity shall be declared by the manufacturer.	1000 litres capacity tank is provided and marked on the tank.	Conforms

5.1.1	The tank when filled up to its total capacity, the tank shall not show any sign of leakage and shall not be buckle.	No leakage or buckling of tank observed.	Conforms
5.2	A **filling hole** of suitable diameter shall be provided on top of the tank.	Circular filling hole of 300 mm diameter is provided on the top of tank.	Conforms
5.2.1	The hole shall be covered with a tightly fitted cap.	The hole is covered with tight cap fixed by clamp.	Conforms
5.2.2	The suitable drain plug shall be provided at the bottom of the tank for cleaning.	Drain plug (PVC On-Off valve) is provided at the bottom of tank.	Conforms
5.3	**Lubrication:**		
5.3.1	A suitable arrangement shall be provided for lubricating the moving parts and shall be indicated by the manufacturer in the manual.	3 nos. grease cup are provided on pump for lubrication.	Conforms
5.3.2	The pump shaft of roller vane type displacement pump shall be supported by permanently lubricated bearings.	Not applicable	--
5.4	**Spreader:** If provided, shall be able to hold the piston in its position without distortion against the wall of the pump cylinder.	Spreader provided which hold the piston against wall of pump cylinder without distortion.	Conforms
5.5	**Driving Shaft:** A suitable driving shaft shall be provided so that either it can be coupled directly to the prime mover or through a pulley.	Drive shaft with chain-sprocket mechanism provided which is driven by tractor PTO shaft.	Conforms
5.6	**Suction Spout:** There shall be one suction spout having serrated nipple or threaded connection. In case of threaded connection, external thread size, minimum of designation G½ B.	1 suction spout of external thread size is 11G1 provided.	Conforms
5.7	**Delivery Spout:** There may be two delivery spouts having threaded connection. The external thread size shall be not less than the designation of G¼ B. The engaged length of the thread shall be not less than 6 mm.	3 delivery spouts having threaded connections are provided. External thread size 14G½ is used. Engaged length of thread is 10.0 mm.	Conforms
5.8	**Overflow Pipe:** An overflow pipe of suitable diameter and length shall be provided.	Overflow pipe of 1350 mm length and 25.0 mm OD is provided.	Conforms
5.9	**Pump Inlet/Outlet Port:** This may be integral or separately attached to the pump body. The thread size of inlet/outlet port shall conform to thread size specified in (see IS: 2643). The engaged length of the thread shall be not more than 8 mm.	Integral part of the pump body. The length of the threaded size connection is 7.0 mm.	Conforms

5.10	**Regulator cum Relief Valve:** A pressure regulator or valve to adjust the working pressure up to rated pressure shall be provided. It shall be able to release all or part of the liquid delivered by the pump to be returned to the tank at set pressure. It shall not allow the increase of pressure by more than 25 percent of the maximum pressure declared by the manufacturer.	Pressure Regulator valve is provided. The maximum rated pressure is within the specified limit.	Conforms
5.11	**Pressure Gauge:** A suitable pressure gauge/pressure indicator having full scale reading not exceeding two and half times and not less than 1.5 times the rated pressure shall be provided.	Pressure gauge provided with full scale reading of 106 kg/cm^2 (1500 psi).	Conforms
5.12	**Pressure Dampener:** A pressure dampener may be provided at the option of the purchaser to facilitate easy reading of pressure.	Liquid pressure dampener is provided.	Conforms
5.13	**Gaskets:** The gaskets, wherever provided shall withstand the test prescribed in 7.4 of IS: 10134.	Not applicable, as PVC gaskets are provided.	--
5.14	**Delivery Hose:** If provided with couplings shall have suitable diameter and length as agreed to between the purchaser and the supplier.	Provided of 250 m length and 18.0 mm OD.	Conforms
5.14.1	**Hose Connections:** The hose connections for threaded type and nipple type connections shall be nut-nipple and clamp type respectively.	Nut-nipple type	Conforms
5.14.2	The **metallic nut** if provided shall have the internal thread size, minimum of designation G¼ B (see IS: 2643). The clamp shall consist of ferrule or clip. Other thread sizes if used shall be of standard pipe threads.	Metallic nut of internal thread size 14G½ is provided.	Conforms
5.14.3	The hose and hose connection shall withstand the test prescribed in 7.2 of IS: 10134	No leakage, crack or breakage is noticed during the test.	Conforms
Clause 7.2 of IS: 10134. (The inlet of the hose shall be attached to a hydraulic pump thorough hose connections. The outer end of the hose shall be connected to the appropriate cut-off device. The outlet of the cut-off device shall be closed, that is, no discharge is allowed. A minimum hydrostatic pressure of 1.5 MPa, using water as a liquid, shall be developed in the hose assembly and the pressure shall be retained for a period of 1 minute). The hose and hose connections shall be deemed to have passed this test if no leakage, crack or breakage is observed during the test.)			
5.15	**Nozzles:** Unless otherwise specified by the purchaser, the nozzle shall conform to the requirement of Annex F of IS: 3652.	Not applicable for spray gun	--
5.16	The **engine** and **electric motor** shall conform to the requirements as given IS: 7347 and IS: 325 respectively.	Not applicable as it is tractor powered sprayer.	--

5.16.1	The exhaust outlet of the engine shall be so positioned that the smoke does not directly affect the operator or crop. A guard shall be provided on or near the exhaust pipe for the protection of the operator.	Not applicable as it is tractor powered sprayer.	--
5.17	The fuel and chemical discharge controls shall be in easy access of the operator.	Not applicable as it is tractor powered sprayer.	--
5.18	Air pressure chamber shall with stand the test prescribed in 8.7 without any deformation or damage.	No damage found in air pressure chamber.	Conforms
Clause 8.7 (The sprayer fitted with pressure gauge shall be operated at four stages of pressure covering the minimum and maximum, and at specified speed for minimum of 30 min. At every pressure setting, the fluctuations of the pressure shall be recorded in C-5. The air pressure chamber shall be tested separately at a pressure 2.5 times the normal working pressure or 1.5 times the maximum working pressure whichever is more for a minimum of 30 sec, to see the pressure resistance of the chamber.)			
6	**PERFORMANCE REQUIREMENT:**		
6.1	**Discharge Rate/Suction Capacity:**		
	When tested in accordance with the method given in 8.3, the pump shall be capable of discharging/sucking a minimum of 8000 ml water per minute at its rated speed and rated pressure.	The pump is capable to discharge 60075 ml/min without gun at 800 rpm of pump speed and 10.0 kg/cm^2 pressure (Refer **Annexure-II**)	Conforms
Clause 8.3 (The discharge rate per minute shall be measured at maximum and minimum working pressures, specified by the manufacturer by suitably collecting the test liquid from delivery outlet and by-pass outlet. The discharge rate shall be measured in at least four equal steps between the lowest and highest pressure. In case the pressure values are not specified the maximum pressure shall not be more than 500 kPa and minimum not less than 50 kPa. During the test period, the pressure shall be kept constant and the deviation, if any shall be kept within ±20 percent. The tank shall be filled with clean water and the prime mover shall be operated at a speed specified by the manufacturer. The discharge of water from delivery spout and by-pass outlet is to be collected into a receiving vessel. The measuring period should be at least 60±1 sec. At each pressure setting, the test shall be repeated for a minimum of four times. The average value of discharge for each pressure shall be obtained and recorded as liters per minute.)			
6.1.1	The discharge rate/suction capacity shall be declared by the manufacturer.	Declared as 60 l/min.	Conforms
6.2	**Volumetric Efficiency:**		
6.2.1	When determined in accordance with 8.4.1 (The actual volume of water in one cycle shall be computed from the average measured discharge. 8.4.1.1: The piston displacement at rated pressure shall be computed by measuring the inner diameter of the pump cylinder and length of the one stroke. The quotient of the value obtained in 8.4.1 and 8.4.1.1 will give the volumetric efficiency), the volumetric efficiency of piston plunger type pump shall be minimum 80 percent.	97.31 %, which is within specified limit.	Conforms

6.2.2	The volumetric efficiency requirement for roller vane type pump shall be minimum 80 percent.	Not applicable	-
6.3	**Power Requirement:**		
	When tested in accordance with the method given in 8.5, pump shaft power requirement shall not be more than that of the value declared by the manufacturer.	Max. Pump shaft power observed is 3.123 kW (Max.) against the declared value of 3.0-7.0 hp by the manufacturer (Refer **Annexure-III**).	Conforms
Clause 8.5 (A dynamometer shall be fitted between the prime move and the main shaft of sprayer. The dynamometer shall be so fitted that there is no appreciable angularity at the joints. The angularity, if present shall not exceed 7°. In case of electric motor, energy meter should be fitted. A pressure gauge at discharge port shall also be connected. The sprayer shall be operated a specified speed with tolerance of 5 percent and at four pressure stages covering maximum and minimum. The liquid shall be collected in receiving vessel for a period of 60±1 sec. The dynamometer or energy meter reading and pressure gauge reading shall also be taken during the collection of liquid. On the basis of above information, power required to operate the sprayer shall be calculated.)			
6.4	**Maximum Achievable Pressure:**		
	When tested in accordance with the method given in 8.7, maximum achievable pressure shall not be less than that of the value declared by the manufacturer.	Max. Achievable pressure observed with gun is 60 kg/cm^2 against declaration as 50 kg/cm^2. (Refer **Annexure-IV**).	Conforms
Clause 8.7 (The sprayer fitted with pressure gauge shall be operated at four stages of pressure covering the minimum and maximum, and at specified speed for minimum of 30 min. At every pressure setting, the fluctuation of the pressure shall be recorded. The air pressure chamber shall be tested separately at a pressure 2.5 times the normal working pressure or 1.5 times the maximum working pressure whichever is more for minimum of 30 sec, to see the pressure resistance of the chamber.)			
6.5	**Endurance Test:**		
	Sprayer shall withstand the test endurance test specified in 8.8.	Endurance test of 56 hr completed without any variation in pressure. Percentage variation is discharge is 1.98 % which is within specified limit (Refer **Annexure-V**).	Conforms
Clause 8.8 (The sprayer shall be operated at specified normal working pressure and speed continuously for a period of minimum 50 h. The discharge shall be collected for a period of 1 min after 15 min of running for the first time. After first collection, subsequent collection of the discharge shall be done for the period of 1 min after every 8 h run. After the test the sprayer shall conform the following requirement. The sprayer shall not show any leakage, deformation or breakdown and any undue knocking or rattling sound. Variation in discharge rate between first and the last observation shall not be more than ± 5 percent.)			
7	**OTHER REQUIREMENTS:**		
7.1	Each sprayer shall be provided with parts catalogue and manual giving detailed information about sprayer, engine, its rated speed along with operational and maintenance instructions and safety precautions.	Manual and parts catalogue is provided by the manufacturer in Gujarati language.	Conforms

7.2	Each sprayer shall be provided with a set of necessary tools, suction strainer having aperture size of 300 µm to 425 µm and a measuring jar for lubricating oil.	Provided	Conforms
7.3	On the option of the purchaser, the following accessories shall be supplied.		
	a) A set of spray nozzles (conforming to Annex F of IS: 3652) for different discharge rates and	Not provided	--
	b) Spray gun conforming to Annex E of IS: 3652	Provided	Conforms

Crop protection equipment-Foot sprayer - Specification (IS: 3652-1995)

E-1	**TYPES:** The spray guns shall be of the following two types a) Trigger type and b) Screw type	Screw type	Conforms
E-2	**DIMENSIONS:**		
E-2.1	The thickness of the wall of the barrel shall be minimum of 0.63 mm.	1.00 mm	Conforms
E-2.2	The diameter of the connecting rod shall be minimum of 5 mm.	5.13 mm	Conforms
E-2.3	The annular clearance between the barrel and the connecting rod shall be not less than 2.5 mm.	4.44 mm	Conforms
E-2.4	The total length of the spray gun when measured from the top of the nozzle to the tip of the trigger or screw shall be not less than 500 mm.	630 mm	Conforms
E-3	**PERFORMANCE AND STRENGTH REQUIREMENS:**		
E-3.1	The discharge rate of the spray gun for extreme adjustment for the fine cone spray and jet spray patterns at a pressure of 600 kPa±60 kPa shall be declared by the manufacturer. The discharge rate when tested in accordance with F-7, shall be within ±10 percent of the declared value.	Not applicable as the working pressure is 60 kg/cm^2 (@ 6000 kPa) which is not covered in reference clause.	--
F-7 (The nozzle under test, shall be connected to a supply of clean water or spray materials which are equal in density, surface tension and viscosity of water. The water or spray materials shall be under a controlled pressure (75 or 300 kPa) the pressure being indicated by a pressure gauge. The pressure gauge shall be positioned immediately before the nozzle and shall have full scale reading of pressure from 0 to not exceeding 2.5 times, not less than 1 times, that is to be read. The fluctuation of the pressure during the test shall be not more than 10 percent from the controlled pressure. Turn on the supply and adjust the pressure and direct the spray, for a period timed by stop watch, in to a receiving vessel so designed as to collect the whole of the spray from the nozzle. The period shall be not less than 60 seconds or less than the time required to discharge 500 ml, whichever is higher. Direct the spray away from the vessel and turn off the supply. Measure the volume of the water or the spray material collected and calculate the discharge rate per minute. Repeat the above test for at least four times and obtain average rate of discharge per minute.)			
E-3.2	The spray angle of the spray gun at a pressure of 600±60 kPa for extreme adjustment of fine cone spray pattern shall be declared by the manufacturer. The angle, when tested in accordance with the method given in F-9, by mounting the gun on test bench, shall not differ by ±5° from the declared value.	Not applicable as the working pressure is 60 kg/cm^2 (@ 6000 kPa)	--

E-3.3	When tested in accordance with the method given in C-6.2, the maximum torque required in case of trigger type spray gun for trigger actuation shall be not more than 7.0 Nm (70 kgf.cm).	Not applicable, as trigger is not provided.	--
E-3.4	The gun shall with stand the tests given in E-3.4.1 and E-3.4.2.		
E-3.4.1	**Test for Jet spray:** A circular area faced with blotting paper or any other suitable paper shall be kept in a vertical plane at a distance of 6 m from the tip of the gun. The place of the testing shall be free from drought. The gun shall firmly secured horizontally. The gun shall be operated at its working pressure (600±60 kPa). If the jet spray reached the paper, the gun shall be deemed to have passed this test.	The jet spray reached at a distance of 6.6 m from the tip of the gun a pressure of 6 kg/cm^2 (@ 600 kPa).	Conforms
E-3.4.2	**Test for Strength:** The spray gun shall be connected to a hydraulic pump. Nozzle tip shall be closed, that it, no discharge shall be allowed through the nozzle. A hydraulic pressure of 1500 kPa shall be applied to the gun up to a period of 5 minutes. During this test, the gun shall not leak, crack or burst.	Not applicable, as trigger is not provided.	--
E-3.5	When tested in accordance with method given in C-9, no leakage or break down shall occur in the spray gun.	Not applicable, as trigger is not provided.	--
E-3.6	When tested in accordance with F-7 and F-9 at a pressure of 600±60 kPa after operating for 48 hours duration with 6 hours continuous stretch in each setting of the fine cone spray and jet spray pattern, the discharge rate and spray angle observed shall not vary by more than ±10 percent and ±5 degree respectively from the initial value obtained before the test.	Nozzle discharge variation is 1.27 % and spray angle variation is 3.75 %, which is within specified limit (Refer **Annexure-IV**).	Conforms
E-4	**OTHER REQUIREMENT:**		
E-4.1	The farthest point of the trigger in case of trigger type shall be at a distance not exceeding 100 mm (to facilitate convenience grip by hand) when the valve is in closed position. When the trigger is pressed for full discharge, it shall have a minimum clearance of 10 mm form the barrel tube.	Not applicable, as trigger is not provided.	--
E-4.2	A lock for locking the trigger in different positions to attain different spray pattern shall be provided.	Not applicable, as trigger is not provided.	--
E-4.3	The total mass of the spray gun having a length up to 1000 mm shall not exceed 1.6 kg.	0.570 kg	Conforms
E-5	**DESIGNATION:**		
E-5.1	The gun shall be designated by its identification mark AG-C-J for fine cone spray and jet spray pattern, spray angle and discharge at a nominal pressure of 600 kPa. Example: An adjustable spray gun capable of giving 80° spray angle with a discharge rate of 1200 ml/min during adjustable in fine cone spray and discharge rate of 3500 ml/min during jet spray at a nominal pressure of 60 kPa shall be designated as AG - C80 1200 -J 3500.	Not designated	Does not conform

E-6	**MARKING:** Each gun shall be marked with the following particulars:		
	a) Manufacturer's name or recognized trade-mark; and	Marked (PMT)	Conforms
	b) Batch or code number	Not marked	Does not conform
9	**WORKMANSHIP AND FINISH:**		
9.1	All the components of the sprayer shall be free from burrs, pits and other visual defects which may be detrimental for their use.	Satisfactory	Conforms
9.2	The exposed metallic parts shall have a protective coating to prevent surface deterioration.	Exposed metallic parts have the protective coating.	Conforms
10	**MARKING AND PACKING:**		
10.1	**Marking:** Each sprayer shall be marked with following particulars:		
	a) Manufacturer's name or his registered trade-mark; and	Marked (Shreeji)	Conforms
	b) Sr. No. and batch or code number	Marked (20/21002)	

6. SUMMARY OF OBSERVATIONS, COMMENTS AND RECOMMENDATIONS

1. Each sprayer should be provided with parts catalogue (material used for different components) and manual giving detailed information about sprayer, engine, its rated speed along with operational and maintenance instructions and safety precautions.
2. The gun should be designated by its identification mark and marked as per IS.
3. The sprayer is provided with accessories for operator's safety against pesticides as a set of mask, hand gloves and safety goggles.
4. Maneuverability of tractor with sprayer was found satisfactory.
5. The overall performance of sprayer was found satisfactory.

Note: Test conducted by Er. H. R. Shekhda, Lab. Tech.

TESTING AUTHORITY

Prof. A. L. Vadher Test Engineer & Assistant Professor	
Dr. T. D. Mehta Test Engineer & Associate Professor	
Dr. K. B. Jhala Testing Incharge and Professor & Head (I/c)	

7. APPLICANT'S COMMENT

1. Each sprayer will be provided with parts catalogue (material used for different components) and manual giving detailed information about sprayer, power requirement, its rated speed along with operational and maintenance instructions and safety precautions.
2. The gun will be designated by its identification mark and marked as per IS.

Annexure-I

Brief specifications of the tractor used during field test

1.	Make, model and type	Captain Tractor, Captain 250 DI (As per CFMTTI, Budni (MP) Test report No. T-1081/1606, April-2017) GJ-11GA-0569
2.	Number of cylinders	2
3.	Maximum PTO power, kW	14.5
4.	Power at standard power take-off speed (540 & 1000 rpm) kW	-
5.	Engine speed corresponding to standard power take-off speed (rpm)	-
6.	Rated engine speed, rpm	2200±50
7.	No load engine speed during field test (rpm)	-
8.	Drawbar power, kW	10.87
9.	Drawbar pull (kN) : Without ballast	5.80
	With ballast	-
10.	Type of wheel equipment	Pneumatic
11.	Number & size of tyre :	
	Front	5.20x14, 8 PR
	Rear	8.00x18, 4 PR, 17 lugs
12.	Inflation pressure of tyres ($kg/cm^{2)}$	
	For Field	Front-22 psi, Rear-12 psi
	For Transport	Front-35.5 psi, Rear-22.7 psi
13.	Standard track width (mm) :	
	Front	880
	Rear	830
14.	Wheel base, mm	1550
15.	Total Operation Mass (kg) :	
	Front	360
	Rear	530
	Total	890

Annexure-II

Data for Discharge Rate Test / Suction Capacity Test

(Cl. 6.1 and 6.2 of IS: 11313-2007)

1. Date of Test: 06/05/2021
2. Atmospheric Conditions:
   a) Temperature: 24.7-41.0 °C
   b) Relative Humidity : 19-72 %
   c) Pressure: 11.0-21.2 mm of Hg
3. Data Recorded:

Sr. No.	Specified Pump speed (rpm)	Working pressure (kg/cm^2)	Test No.	Discharge from the discharge line (ml/min)	Overflow (ml/min)	Average Discharge from the discharge line (l/min)	Suction capacity of pump (l/min)
1	800	10.0	1	9490	50650	9.36	60.075
			2	9250	50760		
			3	9300	50790		
			4	9390	50670		
2	781	20.0	1	12130	47930	12.46	60.100
			2	12500	47220		
			3	12850	47600		
			4	12360	47810		
3	789	30.0	1	15750	43960	15.83	60.083
			2	15990	44500		
			3	15850	44120		
			4	15710	44450		
4	792	40.0	1	19130	41000	19.21	60.665
			2	18870	41360		
			3	19000	41800		
			4	19850	41650		

Annexure-III
Data for Pump Power Requirement Test

(Cl. 6.3 of IS: 11313-2007)

1. Date of Test: 06/05/2021
2. Atmospheric Conditions:
   a) Temperature: 24.7-41.0 °C
   b) Relative Humidity : 19-72 %
   c) Pressure: 11.0-21.2 mm of Hg
3. Data Recorded:

Sr. No.	Working pressure (kg/cm^2)	Telemetry reading, Torque (kg.m)	Pump speed (rpm)	PTO speed (rpm)	Power requirement (kW)	Discharge from the discharge line (ml/min)	Overflow (ml/min)	Suction capacity of pump (l/min)
1	10.0	3.55	800	500	1.821	9360	50660	60.020
2	20.0	4.90	781	488	2.453	12450	47330	59.780
3	30.0	5.60	789	493	2.832	15500	43750	59.250
4	40.0	6.15	792	495	3.123	19580	41330	60.910

Annexure-IV
Data for Pressure Adjustment Test

(Cl. 6.4 of IS: 11313-2007)

1. Date of Test: 06/05/2021
2. Atmospheric Conditions:
   a) Temperature: : 24.7-41.0 °C
   b) Relative Humidity : 19-72 %
   c) Pressure: 11.0-21.2 mm of Hg
3. Data Recorded:

Sr. No.	Working pressure (kg/cm^2)	Fluctuation range (kg/cm^2)	Pressure drop (kg/cm^2)	Ratio
1	10.0	Nil	Nil	--
2	20.0	Nil	Nil	--
3	30.0	Nil	Nil	--
4	40.0	Nil	Nil	--
5	60.0	Nil	Nil	--

4. Resistant to pressure: Yes

Annexure-V

Data for Endurance Test on Test Rig

(Cl. 6.5 of IS: 11313-2007)

The pump was operated at working pressure (10 kg/cm^2) and speed (800 rpm) by the tractor. The discharge was collected for a period of 1 min after 15 min of running for the first time. After first collection, subsequent collection of the discharge were done for the period of 1 min after every 8 h run.

Sr. No.	Date	Duration (h)	Total discharge (ml/min)	Nozzle discharge (ml/min)	Nozzle spray angle (degree)
1	07/05/2021	8	59650	4730	80
2	08/05/2021	8	60910	4690	81
3	09/05/2021	8	60240	4710	79
4	10/05/2021	8	60100	4620	80
5	11/05/2021	8	59930	4590	82
6	12/05/2021	8	59890	4600	79
7	13/05/2021	8	60830	4790	83
	Total	56.0			

Percentage variation from 1st to last collection = 1.98 % (from discharge line)

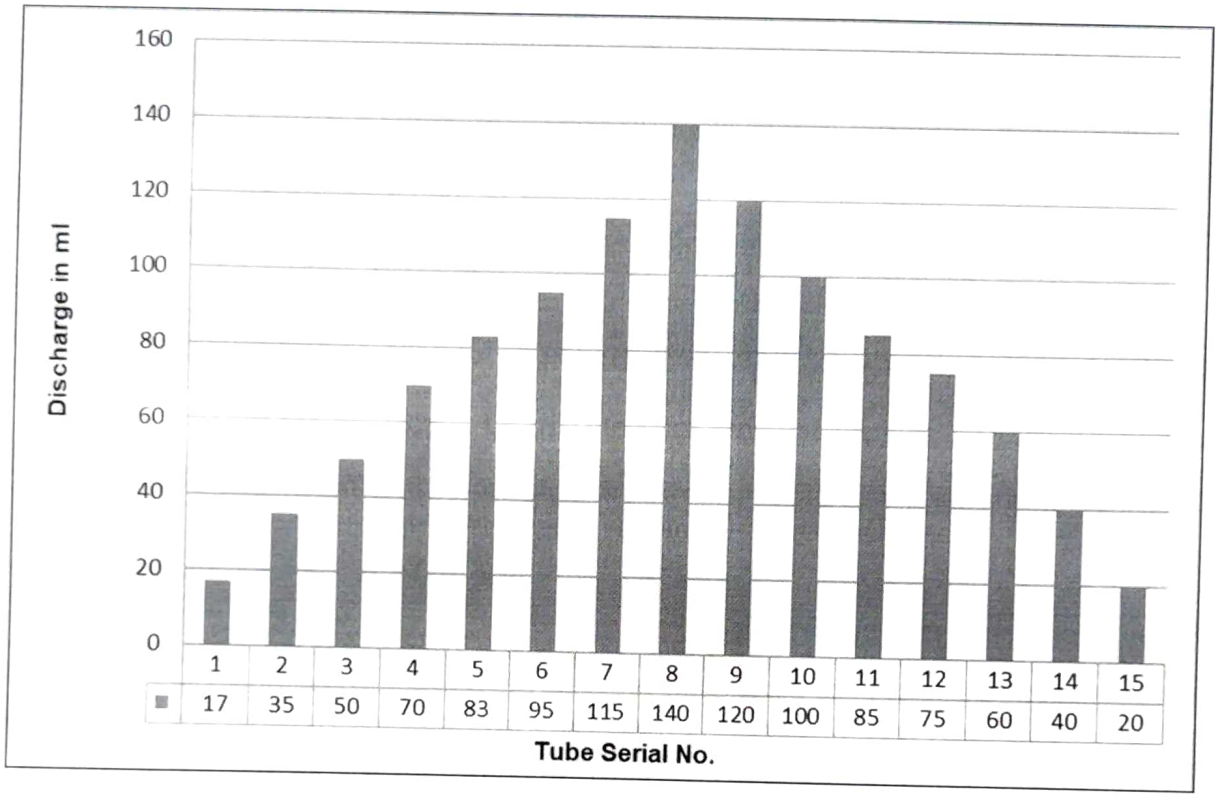
Percentage variation from 1st to last collection = 1.27 % (from nozzle)

Percentage variation from 1st to last collection = 3.75 % (Nozzle spray angle)

ANNEXURE-VI

Spray Distribution Pattern Test

Spray Distribution Pattern of the nozzle (1- hole) through Tractor operated power sprayer "Shreeji-SAI 777" based on approx. 1.0 litre discharge



Annexure-VII

Symbols and Abbreviations

A. Symbols assigned to basic SI units

Sr.	Physical Quantity	Name of SI Unit	Symbol
1	Length	Meter	m
		Centimeter	cm
		Milimeter	mm
2	Mass	Kilogram	kg
		Gram	g
		Tonne	t
3	Time	Hour	h
		Minute	min
		second	S

B. Symbols assigned to some derived units

Sr.	Physical Quantity	Name of SI Unit	Symbol
1	Area	Square centimeter	cm^2
		Square meter	m^2
		Hectare	ha
2	Speed/Velocity	Meter Per second	m/s
		Kilometer per hour	km/h
3	Pressure	Newton per square milimeter	n/mm^2
4	Time	Minute	min
		Hour	h
5	Volume	Cubic centimeter	cm^3
		Mililitre	ml
		Litre	l

C. Abbreviations

Cl	:	Clause	Fig.	:	Figure
deg	:	Degree	kW	:	Kilowatt
IS	:	Indian Standard	N.A.	:	Not Applicable
No.	:	Number	%	:	Percent
N.R.	:	Not Recorded	rpm	:	Revolution per minute
Ref.	:	reference	km/h	:	Kilometer per hour