

**AGRICULTURAL MACHINERY FUNCTIONAL  
AND SAFETY TESTING SERVICE**

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**Knapsack motorized air-assisted sprayer: M1200**

Testing station:



Manufacturer:

**Cifarelli SpA**  
**Strada Oriolo, 180**  
**27058 Voghera (PV) - ITALY**

Test report n°

**05b.007**

Rome, April 2018<sup>(\*)</sup>  
(First issue: March 2013)

**TECHICAL DATA****SIZE AND WEIGHT**

total weight, unload (kg)	12
total weight, load - man (kg)	30
total weight, load - woman (kg)	25
dimension <sup>(*)</sup> :	
height (mm)	750
width (mm)	360
depth (mm)	330

(\*)engine unit only (without spray gun)

**PHYTOIATRIC MIX TANK**

material	polyethylene
nominal capacity man (l)	16
nominal capacity woman (l)	11
diameter filling hole (mm)	146
emptying system :	
type	gravity
position	tank base
graduated content indicator:	
type	printed on the tank
position	front
sensitivity (l)	1

**ENGINE**

model	CIFARELLI C7
type	2-stroke, single-cylinder
cooling system	air
displacement (cm <sup>3</sup> )	77
rpm max. (kW)	3.6
rpm max speed	6700

**FUEL TANK**

material	polyethylene
nominal capacity (l)	2.15

fuel mix of petrol and oil for 2-stroke engines

**PUMP**

Upon request

**FILTERS**

total number	2
filter1:	
position	filling hole
filter 2:	
position	delivery

**FAN**

type	centrifugal
axis of rotation	horizontal
number of speed	1
nominal flow rate (m <sup>3</sup> /h)	1630

**PNEUMATIC DIFFUSERS**

air outlet section diameter (mm)	85
number possible positions	9
nominal flow rate (l/min)	

	Position	Flow
	1	0.1
	2	0.7
	3	1.4
	4	2.1
	5	2.7
	6	3.0
	7	3.2
	8	3.4
	+	3.5

(<sup>1</sup>): As declared by the DISAFA technicians on 5<sup>th</sup> of February 2018 the present test report may be maintained.

Concerning the safety aspects the machine was submitted to a new verification in compliance with the VS Enama certification scheme.

## **DESCRIPTION OF THE MACHINE**

The knapsack motorized air-assisted sprayer with internal combustion engine, is designed for use on herbaceous crops, fruit trees and shrubs. Liquid is sprayed and droplets conveyed by an air stream generated by a centrifugal fan, in turn operated by an air-cooled, 2-stroke, single-cylinder spark-ignition engine.

It is possible to adjust the speed of rotation of the fan and thus outgoing air velocity, using the accelerator control located on the grip.

The polyethylene tank of the spray mixture is equipped with graduated content indicator on the front, looking the machine from the blowing/spraying side.

A strainer filter is present on the filling opening, while there is a filter cylinder in the delivery section.

The START, STOP, spraying and accelerator controls are positioned on the grip, and are within easy reach of the carrier.

The spray mixture present in the stream of air generated by the fan is injected by falling in the proximity of the end part of the diffuser.

In order to adjust the outgoing liquid flow it is necessary to turn clockwise or counter-clockwise the end part of the diffuser located in the proximity of the air outlet opening, and select the position needed between 9 possible different positions (from “1” to “+”).

## **MAIN RESULTS OF THE FUNCTIONAL TEST**

### **Stability on slope**

The machine was stable when laid on a sloping bed having an incline of 15%, with the tank both full at its nominal capacity and empty.

### **Spray mixture tank**

The maximum capacity was 18 (+13% vis-à-vis nominal value).

The tank with the strainer filter installed and with the rate of 32 l/min, can be filled in 30 seconds. The liquid never comes into contact with the belt harness during the filling. The extraction system collects liquid without contaminating the operator.

### Tank content indicator

The content indicator is in intervals of 1 l and is visible during filling operations. The maximum deviation between the gauge value and the actual amount was 7.4% up to 20% of nominal capacity and 4.9% for the remaining part of the gauge (Fig.1).

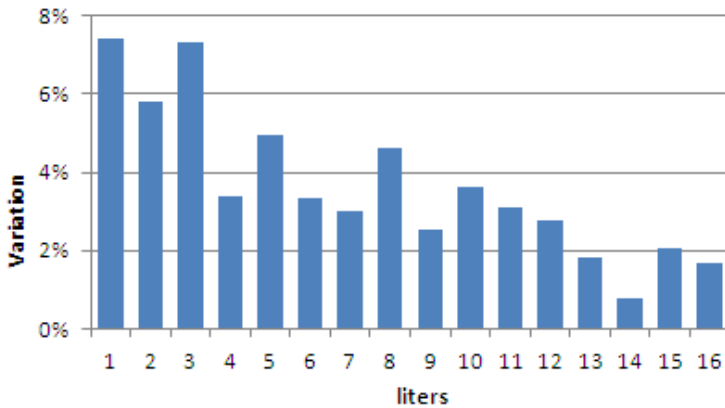


Fig. 1 - Content indicator: deviation (%) between nominal and actual value.

### Residue in tank

The amount of liquid remaining in the tank after the collapse of the spray was 11 ml, while the residue after the “manual” emptying of the tank is 32 ml.

### Delivery rate

The nozzles’ flow rate was measured at the maximum number of engine revs (6700 rpm). The maximum deviation between the measured and nominal rates is +15% in

correspondence of the nominal flow rate 0.1 l/min and -15% in correspondence of the nominal flow rate 3.4 and 3.5 l/m (Fig.2).

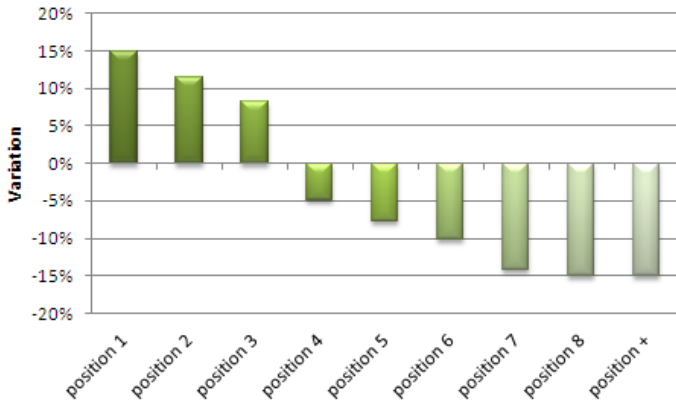


Fig. 2 – Nozzle capacity: deviation between nominal and measured flow rate.

## Air velocity

The air velocity was measured at the maximum number of engine revs (6700 rpm). The maximum air velocity measured 3 m from the distribution unit is 10.3 m/s (Fig.3). At 6 m from the distribution unit the maximum air speed fell to 5.3 m/s.

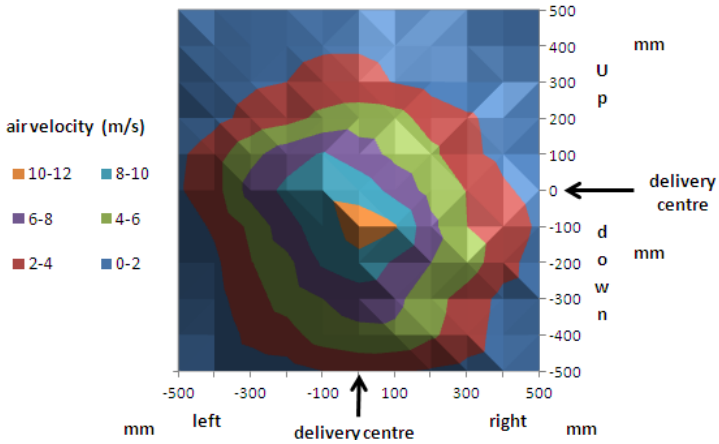


Fig. 3 - Diagram of the air speed measured at 3 m from the distribution unit.

### Droplets size

The droplet size was measured at the maximum number of engine revs (6700 rpm). Regardless of the flow rate delivered, the nozzles equipped deliver droplets reduced in size and classified as fine (Fig. 4).

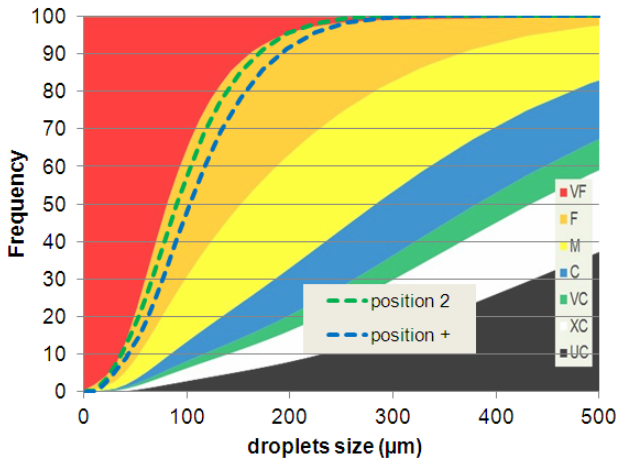


Fig. 4 – Size of the droplets delivered with flow position “2” and “maximum” (“+”).

In particular, D50 (VMD), the value representing the average size of the droplet contained in the spray, and constituting the up to 50% of the total volume of the spray, is between 90 and 103  $\mu\text{m}$ .

The average size of the smallest droplets, namely that portion of droplet' population representing 10% of the flow delivered (D10), results between 37 and 43  $\mu\text{m}$ , while the average size of the largest droplets, namely that portion of droplet' population representing 10% of the flow delivered (D90), results between 169 and 191  $\mu\text{m}$  (Table 1).

Flow rate position	D10	D50 (VMD)	D90
“2” (0.7 l/min)	37 $\mu\text{m}$	90 $\mu\text{m}$	169 $\mu\text{m}$
“+” (3.5 l/min)	43 $\mu\text{m}$	103 $\mu\text{m}$	191 $\mu\text{m}$

Table 1 – Average droplets sizes for the category D10, D 50 (VMD) and D90.

## Horizontal spray range

The horizontal range was measured at the maximum number of engine revs (6700 rev/min).

The maximum deposit is reached 8 meters from the delivery point, regardless the flow rate adjustment/position selected (

Fig.5).

The testing protocol considers the sampling up to 13 meters as maximum distance from the delivery point; at such distance the spray range did not reached the zero. Therefore, can be affirmed the jet sprayed by the machine can reach distances longer than 13 meters.

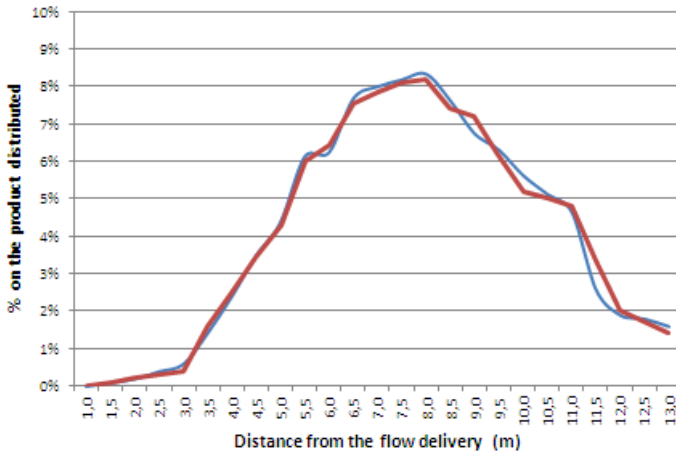


Fig. 5 – Horizontal spray - in blue: position “1” (0.1 l/min), in red: position “+” (3.5 l/min).

## Vertical spray distribution

The vertical spray distribution was measured at the maximum number of engine revs (6700 rpm).

The vertical distribution diagram related to the spray delivered 3 meters height, is adequately even and symmetric.

Following, by way of example, the diagram resulting from the position “+” (3.5 l/min, Fig. 6).



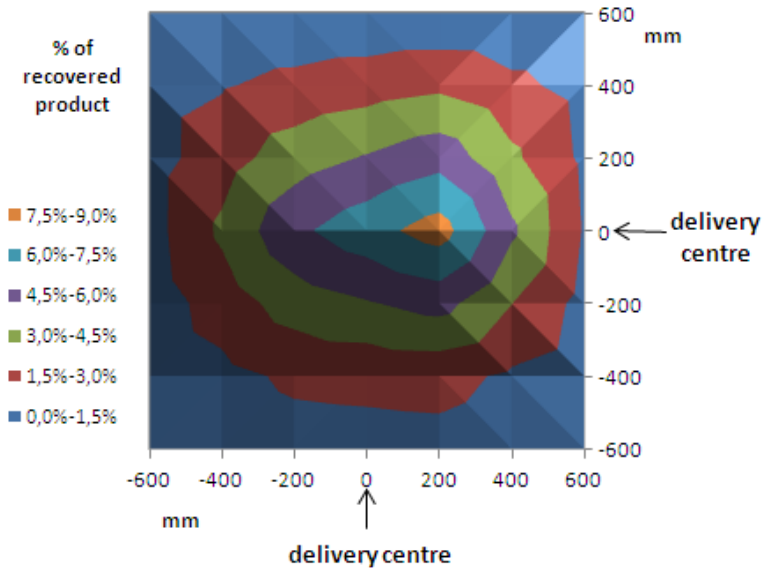


Fig. 6 – Diagram of the vertical distribution.

## Wear of components in contact with the spray mixture

The components which are in contact with the spray mixture shown a good resistance to chemical aggression.

The highest weight variations measured at the conclusion of given testing procedure, are 4.3%.

## NOTES ON FUNCTIONALITY

The tested machine, proved capable of ensuring adequate performance in relation to the job required of it. Measured performance results, matched with the limits set out in the related testing protocol, are summarised in table 2.

Parameter	Measured value	limit
Max capacity of the tank in respect to the nominal capacity (%)	13%	$\geq 5.0\%$
Filling hole diameter (mm)	146	$\geq 100$
Leaks during the filling (ml)	0	$\leq 5$
Retaining on the belt harness during the filling	no retaining	no retaining
Internal residue total volume (ml)	11	$\leq 250$
Residue after the emptying (ml)	32	$\leq 50$
Precision of content indicator (max. deviation)		
up to 20% of nominal capacity	7.4%	
over 20% of nominal capacity	4.9%	$\leq \pm 5.0\%$
Nozzle capacity (max. deviation vis-à-vis nominal)	15%	$\leq \pm 15.0\%$
Stability on sloping bed (8.5°)		
empty tank	stable	must be stable
full tank	stable	must be stable
Usury of components		
weight max variation	+4.3%	$\leq \pm 10\%$
functionality	correct	must be correct

Table 2 - Summary of main measured values and comparison with limits set by the related testing protocol.

## **RECOMMENDED CONDITION OF USE**

The results of tests indicate that the machine to which the present test report refers is suitable for use in the fields (vines, ornamental plants with foliage, etc...).

Indoor operations or in greenhouse are not recommended due to exhaust emissions which may be noxious for the operator' health.

## **SAFETY CHECKS**

The machine is endowed with CE marking, an identification plate, safety pictograms, an instruction handbook and an EC manufacturer's declaration of conformity.

The machine conforms to the requirements of safety of ENAMA specifications category 05b.01 Crop protection machines: Knapsack air-assisted sprayers motorised or power supply - Rev.3.1 dated 2012/11/28, containing the regulations of the Directive 2006/42/CE, Directive 2009/127/CE and the following harmonized standards and technical specifications:

UNI EN ISO 4254-6:2010, UNI EN ISO 28139:2010, ISO 11684: 1995.

The relative documentation has been filed.

The present test report is valid for a period of five years or until the reference regulations for the Knapsack motorized air-assisted sprayer Cifarelli model M1200 are altered.

The machine has been submitted for certification at the request of the manufacturer.

Functional testing was carried out at the Crop Protection Technology Laboratory, Department of Agricultural, Forestry and Food Sciences of the University of Turin (DiSAFA).

Supervisor: Prof. Paolo Balsari

Data collectors: Dr. Mario Tamagnone, P.I. Claudio Bozzer, Dr. Simone Savoia

The test results are in compliance with ENAMA Specifications for the testing of functional characteristics of "Knapsack air-assisted sprayers motorised" (Category 05b - Rev.3.0 dated February 2012).

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(\*) ENAMA is accredited by ACCREDIA for the VS ENAMA safety certification scheme

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