atomizzatori
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INSTRUCTIONS FOR SPRAYER ADJUSTMENT

THE LOW VOLUME

Where we are


A8 VA
A4 TS
A4 TO
Milano
S.S.35 dei Giovi
A7
A1
S.S. 9 Via Emilia
Pavia
Stradella
S.S.35
A21
A21
A21 BS
S.S. 10
cima
Casteggio
Piacenza
A1 BO
A21 TO
S.S. 10
Voghera
S.P. Stradella - Zavattarello
Montù Beccaria
S.S. 9
A7 GE
Zavattarello

REMARKS

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FIRST SECTION

SECOND SECTION

REMARKS

REMARKS

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1 BASIC INFORMATION ON "LOW VOLUME" 1

It is traditionally recognised that for the deployment of agro-chemicals, despite the evolution of equipment specific to this purpose, we've always had to utilise water as the means through which adequate coverage of the crop is obtained. Its "atomizing" into minute droplets is the only way to obtain a homogeneous distribution of small active principle quantities over vast vegetable crop surfaces.
The measuring unit for the diameter of the droplets obtained through this pulverising action is MICRON. It corresponds to the one-millionth part of 1 millimetre.

$$1\ MICRON = \frac{1\ mm}{1000}$$

The classic system used for the transformation of water, conventionally called "NORMAL VOLUME" consists of using strong pressure to force it through one or more jets of very minute diameter. By using this principle, all kinds of pumps are manufactured: knapsack pumps, pressure pumps and membrane or piston pumps, utilised in the production of spraying dusters and turbo-sprayers.

Based on the principle of the **"Venturi tube"**, another spray system was developed. It consists in causing a very strong air current that is forced into a tube to then be released through a suitable narrowing throat.
The water, without pressure, is brought to and forced through the centre of the throat where it is atomized through the action of the air velocity. The application of this principle is a binding and indispensable condition for the manufacturing of **pneumatic sprayers**.

Appropriate and specific technical tests have allowed examination of the considerable difference existing in the diameter of the droplets generated by these two "spray" systems. The "normal volume" (air assisted) shows up 85% of the droplets with a diameter of 250/300 micron with the characteristic that this value cannot be reduced, even when the operating atmospheres are increased. The second system (pneumatic sprayers) creates a water mist in which 90% of the droplets show a much smaller diameter (normally, with correct adjustment, in the region of 100 micron).

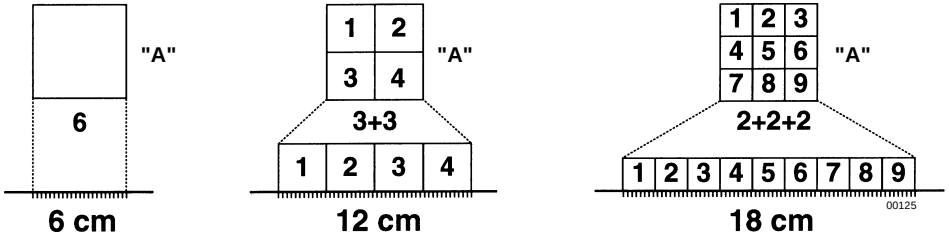
This considerable difference is fundamental. Utilising the same volume of water, this allows pneumatic sprayers to cover a considerably larger area, compared with traditional pumps. In other words, sprayers can cover the same crop surface treated by normal volume machines, but with a much lesser quantity of water, in other words with a **"LOW VOLUME" of water**.

By expressing the concept in graphic terms, let's examine a droplet "**A**". For simplicity of discussion we will represent it in the form of a square with sides measuring 6 cm.

The contact side is 6 cm.

From the same square "**A**" we have drawn 4 with 3-cm sides, thus obtaining a 12-cm contact line.

Again, always from square "**A**", we have drawn 9 with 2-cm sides, which extends the contact line to 18 cm.

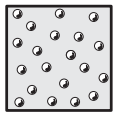


In this way it is easy to understand how it is possible for a droplet, which is turned into smaller ones, to double up, triple or quadruple its coverage capacity. It is also easily understood, if one can count on a certain quantity of water, how the possibilities for coverage can be different and are strictly linked to the method used to make spray droplets.

The diameter of the droplets generated is of fundamental importance and it can be verified through the following physical explanation: *1 l of liquid (1 dm^3) sprayed can cover a surface of 1 hectare with a density of 20 droplets per square cm, if their diameter measures 100 micron (pneumatic sprayers). If this diameter is increased to 300 micron (air assisted) the number of droplets per square cm only amounts to 0.7.*

1 l/ha with Ø 300 micron = 0,7 droplets per square cm (NORMAL VOLUME)

1 l/ha with Ø 100 micron = 20 droplets per square cm (LOW VOLUME)



Please take note that the QUANTITY of AGRO-CHEMICAL to be distributed per HECTARE, according to the crop to be treated, REMAINS UNCHANGED, independently of the machine type deployed. This is drawn from the tables present on the products' packages and is dependent on the quantity of water utilised for "that" specific crop surface in the preceding treatments.

The utilisation of the sprayer with the power take off (PTO) at 540 RPM guarantees the best result of the treatments. It is in any case admissible to use the unit at revs between 500 and 620 RPM.

These informative notes end with summary statements on the salient points that characterize this treatment technique.

The purpose is solely that of emphasising certain normally disregarded aspects and to prompt considerations that will inevitably have to be explored in depth under more appropriate circumstances.

Having stated the above, it is advisable for the operator to consider the relationship linking the WORKING WIDTH, or the presence of plants growing to a marked foliage mass, and the TRAVEL SPEED in the definition of the HOURLY DELIVERY CAPACITY.

These two parameters have to integrate and maintain the delivery capacity within values that must guarantee adequate coverage within to the machine's functional specifications. In other words it would be opportune to focus attention on the principle of the value of the working width increasing as that of the travel speed diminishes and vice versa.

In the latter instance one must remember that, in order to obtain better results the speed must always be kept not too high.

Generally speaking therefore, it is advisable to select balanced conditions between the travel speed and the quantity of litres/hectare to be delivered.

The speed must be such as to allow penetration into the foliage mass and the volume of mixture to be distributed must adequately cover the whole surface of the plants' vegetation without causing dripping.

Appropriate spraying for a low-volume treatment requires that the hourly delivery capacity should never be excessive. It follows therefore, that high travel speeds above the norm should be avoided. This condition would imply the utilisation of delivery capacities that the air speed would be unable to spray suitably: "The smaller the droplets, the more effective will be the treatment".

The performance outlined is obtained with the power take off (PTO) set at 540 RPM.
For good treatment results this condition MUST ALWAYS BE OBSERVED during the machine deployment. The utilisation with speeds between 500 and 620 RPM is permitted.

INTERVENTIONS TO MODIFY THE STRUCTURE OR THE OPERATION OF THE SPRAYER BY THE OWNER AND/OR OPERATOR OF THE SPRAYER ARE NOT ALLOWED. ANY REPAIR SHALL BE CARRIED OUT AT THE DISTRIBUTORS OR AT THE WORKSHOPS AUTHORIZED BY C.I.M.A. S.p.A., OTHERWISE EVERY WARRANTY RIGHT WILL BE LOST AND C.I.M.A. S.p.A. WILL BE RELIEVED FROM ANY CONSEQUENT RESPONSIBILITY.

1	**"L" LENGTH OF WORK (m)**	If with every pass, 2 rows are covered, distanced by **2.50 meters**, the working width to be considered is: 2 rows times 2.50 metres ..... **= 5 m**
2	**"V" TRAVEL SPEED (km/h)**	After having operated practically on the field, a travel speed 5.5 of Km/h is established ..... **= 5,5 km/h**
3	**"S" HOURLY SURFACE (ha/h)**	The hectares that will be treated in an hour are calculated by multiplying the WORKING WIDTH "**L**" by the travel speed "**V**" divided by 10 (L x V) : 10 = (5m x 5,5km/h) : 10 ..... = **2,75 ha/h**
4	**"W" LITRES PER HECTARES (l/ha)**	It is suggested that the treatment be carried out by utilising a quantity of mixture per hectare of ..... = **200 l/ha**
5	**"Q" HOURLY DELIVERY CAPACITY (l/h)**	The litres that the sprayer must spray in an hour of work, indispensable for calibrating the machine, are calculated by multiplying the hourly work surface "**S**" by the value "**W**" (2,75ha/h x 200 l/ha) = ... = **550 l/h**
6	**ADJUSTMENT OF THE SPRAY SPRAYER**	In the following example, a chemical in powder form is uses, with an operative setting of the working pressure at 1.5 atmospheres. In the DELIVERY CAPACITY TABLE, corresponding with the column relative to the pressure of 1.5, select the delivery capacity value closest to 550, in other words 562, to which POSITION 9 of the rotating discs corresponds. With this adjustment the litres per hectare (l/ha) actually distributed will correspond to 562 l/h : 2,75 ha/h = 204 l/ha.
	DOSAGE OF THE MIXTURE	From the treatments applied in the previous seasons, 3 kg of product were distributed per hectare. With the spraer the same quantity of chemical must be used, that will be distributed with the 204 litres of mixture used for the treatment of a hectare. The mixture must be prepared with 1.47 kg of agro-chemical for every 100 litres of water: (3kg/ha : 204l/ha) x 100l = 1.47 kg After having completed the intervention on the 9 hectares of the crop 204 x 9 = 1,836 litres of water and 27 kg of agro-chemical will have been distributed.

AT AN EVEN WATER VOLUME

	MACHINE USED	SPRAY SYSTEM	PRODUCT USED	SURFACE TREATED	MIXTURE CONCENTRATION
TANK CAPACITY 1000 Litres	AIR ASSISTED	NORMAL VOLUME	Kg 3	1 ha	1 TIME OR NORMAL = 300 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME	Kg 9	3 ha	3 TIMES = 900g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME	Kg 12	4 ha	4 TIMES = 1200 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME	Kg 15	5 ha	5 TIMES = 1500 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME	Kg 24	8 ha	8 TIMES = 2400 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME	Kg 30	10 ha	10 TIMES = every 100 litres i

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AT AN EVEN TREATED SURFACE

	MACHINE USED	SPRAY SYSTEM	PRODUCT USED	SURFACE TREATED	MIXTURE CONCENTRATION
1 HECTARE	AIR ASSISTED	NORMAL VOLUME	kg 3	1000 litres	1 TIME OR NORMAL = 300 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME		333 litres	3 VOLTE = 900 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME		250 litres	4 VOLTE = 1200 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME		200 litres	5 VOLTE = 1500 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME		125 litres	8 VOLTE = 2400 g every 100 litres
	PNEUMATIC SPRAYER	LOW VOLUME		100 litres	10 VOLTE = 3000 g every 100 litres

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NORMAL VOLUME
Treatment of 1 hectare with 1000 litres of water and 3 kg of product

LOW VOLUME
Treatment of 1 hectare with 3 kg of product. The concentration of the mixture is selectable, according to the litres/hectare to be used

AIR-ASSISTED
1000 litres
Mixture concentration: 1 time or normal

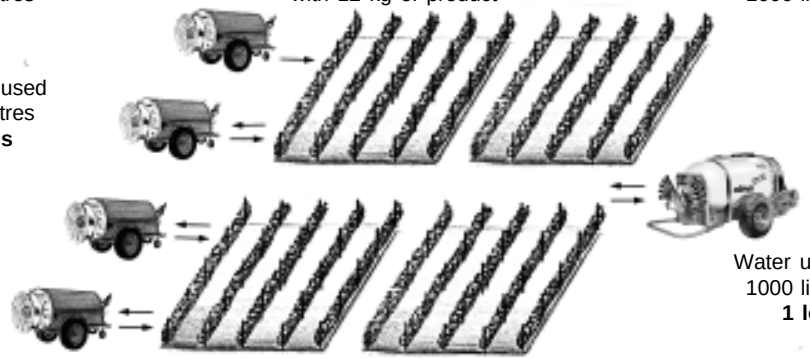
PNEUMATIC SPRAYER
250 litres
Mixture concentration: 4 times or quadruple

AIR-ASSISTED
1000 litres

COVERAGE OF 4 HECTARES
with 12 kg of product

PNEUMATIC SPRAYER
1000 litres

Water used
4000 litres
4 loads



Water used
1000 litres
1 load

Mixture concentration: 1 time or normal

Mixture concentration: 4 times or quadruple

1.1 - UNIT OF MEASURE AND CODES

cm ..... centimeter
g ..... grams
h ..... hour
ha ..... hectare
ha/h ..... hectares per hour
l ..... litre
l/h ..... litres per hour
l/min. ..... litres per minute
kg ..... kilogram
kg/cm² ..... kilograms per square centimetre (atmosphere)
km ..... kilometre
km/h ..... kilometres per hour
Lm ..... width in metres
m ..... metre
Mesh ..... N° of meshes per liner inch
Micron ..... 1/1000 of millimetre
mm ..... millimetre
PTO ..... Power take-off
RPM ..... revs per minute
s ..... second

8 Practical adjustment example

A) Intervention with a sprayer (equipped with N+N head, as an example) over 9 hectares of crop with rows set at 2.50 m, and in which 2 rows are covered at every pass.

B) For the treatments carried out during the previous seasons, with a normal-volume, traditional machine, 800 litres of water and 3 kg of chemical were distributed for every hectare, preparing a mixture with doses of 375 g of product for every 100 litres.
The interventions used to call for the utilisation of 7,200 litres of water and 27 kg of agro-chemicals.

HEADS TABLE: N+N HEAD (*)			
With regulator discs in position:	DELIVERY OF THE HEAD (litres/hour) with power take off (PTO) at 540 RPM		
	Operating pressure kg/cm²		
	1,5	2	2,5
1	81	86	90
2	100	109	114
3	133	148	157
4	176	190	200
5	231	248	267
6	257	274	290
7	380	400	437
8	448	485	524
9	**562**	606	655
10	640	702	757
11	842	923	985
12	1206	1312	1407
13	1608	1777	1936
14	2052	2391	2603
15	2910	3248	3492

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(*) indicative values provided ONLY as an example. For the machine adjustments always refer to the “Operation and maintenance” manual of the distribution device

SUMMARY TABLE OF OPERATIONS FOR THE SPRAYER ADJUSTMENT

1st CALCULATE	2nd DEFINE	3rd OBTAIN	4th DEFINE	5th DERIVE
WORKING WIDTH	TRAVEL SPEED	HOURLY WORKED SURFACE	LITRES PER HECTARE	HOURLY DELIVERY CAPACITYE
Inter-row distance in metres times the number of rows covered at every pass	relative to the gear selected to carry out the treatment in km/h	hectares treated per hour due to the width work, multiplied by the progress speed, : 10	quantity of water selected per hectare for the treatment, expressed in litres	quantity in litres that the machine must deliver in an hour in order to carry out the wanted treatment
L (m)	**V (km/h)**	**S=LxV:10 (ha/h)**	**W (l/ha)**	**Q=SxW (l/h)**

6th ADJUST THE SPRAYER

From the delivery capacity Table, provided with every head, in correspondence with the selected operating pressure search for the hourly delivery capacity value derived (5). Note the corresponding number of the regulator disc, marked from 1 to 15.
If the value of the hourly delivery capacity (5) doesn't coincide with those indicated by the Table one must refer to the one closest. The new value derived, divided by the surface worked hourly (3) will provide the effective quantity of litres delivered per hectare 'Q.'
Should an appreciable difference result from the value of the delivery capacity calculated and that indicated by the table, adapt the operating pressure by 1 or 2 tenths of atmosphere by turning the knob of the pressure regulator.
POSITION ALL THE REGULATOR DISCS OF THE SPRAYER ON THE NUMBER DERIVED AND CARRY OUT THE TREATMENT WITH THE CORRESPONDING OPERATING PRESSURE INDICATED BY THE TABLE.

7TH PROPORTION THE MIXTURE

The quantity of chemical to be used must be calculated according to the surface to be treated. Independently of the type of equipment or litres of water utilised, every hectare of the crop always necessitates the same quantity of product. ON EVERY HECTARE OF CROP THE SAME QUANTITY OF PRODUCT MUST BE USED, AS WAS DISTRIBUTED DURING THE TREATMENTS CARRIED OUT IN THE PREVIOUS SEASONS, MIXING IT WITH THE VOLUME OF WATER CHOSEN FOR THE TREATMENT.
In order to rationalise the intervention, remember that for the "quantity distributed per hectare in the previous seasons" one must consider only that part of product actually distributed on the crop. If it refers to treatments carried out by means of the normal volume system, the dose of agro-chemical per hectare can be reduced.

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2 DEFINITION OF ADJUSTMENT DATA 2

The technical principle concerning **ATOMIZING AND PNEUMATIC TRANSPORTATION OF THE AGROCHEMICAL MIXTURE WITH ADJUSTMENT OF THE FLOW CAPACITY**, utilised on our sprayers, considerably enhances the traditional coverage capabilities of the water and ensures, with very limited deployment volumes, interventions that are very high in terms of quality, economically advantageous and responding to the current mandatory needs to protect the environment against pollution.

To these positive operative conditions one must add the possibility of carrying out treatments whose mixture volume to be provided per hectare is defined by the user according to needs and capacity.

Necessarily, in order to implement interventions of this type, before using the sprayers these must be suitably adjusted. This operation is in itself quite simple, but it can only be carried out after having defined several parameters linked to the structural specifications of the crop to which the treatment must be applied and the corresponding results to be attained.

From this viewpoint, therefore, it is mandatory to specify the parameters applicable and above all, which modalities are to be applied in order to define them.

1 Width of the treatment “L” (m)

This measurement implies the width of the ground that encompasses the number of rows treated at every pass.

In order to facilitate the definition of these parameters, one must take into account that each row occupies a ground strip whose width is equal to the distance existing between the rows.
In fact, in a crop with inter-rows of 3 metres, each row occupies a strip of ground 3 metres-wide: 1.5 on the one side and 1.5 on the other. If with every pass 2 rows are covered, corresponding to 2 strips of ground, the virtual width of the treatment will amount to 6 metres.

The WIDTH OF THE TREATMENT, therefore, IS OBTAINED BY MULTIPLYING THE NUMBER OF ROWS TREATED WITH EVERY PASS BY THE DISTANCE IN METRES EXISTING BETWEEN THE CROP’S ROWS. The calculation will possibly have to take the half rows into consideration too.

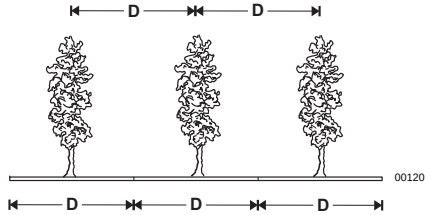
The definition of these parameters is very simple since it is drawn from the defined and known dimensions that characterise the crop on which the intervention is required.

When distribution devices (heads) are used on a “full field with lateral spraying” (tobacco cannon jets or similar) the width in metres covered by the spraying must be taken into consideration.

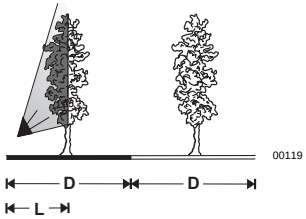
To illustrate this, a synthetic diagram is proposed with one of the various coverage possibilities by the standard distribution devices available. The graphic indications represent the different field conditions experienced and can contribute to a better understanding of the modalities by which to define these parameters, according to the specific characteristics of every intervention. It must be emphasised that various possibilities proposed **depend on the crops plant system, on the structure and development of the plants, on the ground configuration and on the power of the tractor available**.

ROWS COVERED AT EVERY PASS

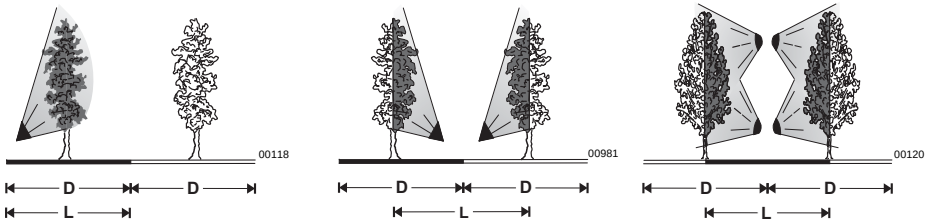
PRELIMINARY CONSIDERATION: “D” indicates the distance in metres between the crop’s rows.
This measurement is equal to the width of the strip of ground occupied by every row.
As an example hypothesis, “D” is set at 3 metres.

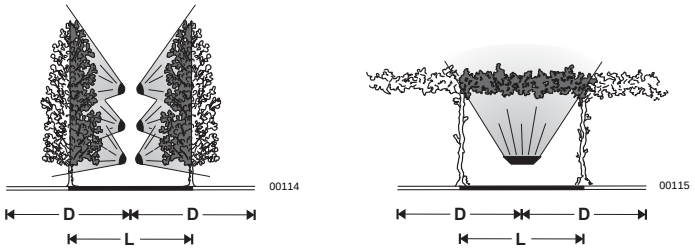


0.5 = HALF ROW L = D x 0.5 = 3 x 0.5 = 1.5 metres
The width corresponds to a strip of ground that is half the distance between the rows. It requires 2 passes for every row.



1 = ONE ROW L = D x 1= 3 x 1= 3 metres
The width corresponds to a strip of ground which is as wide as the distance between the rows. It requires a pass for every row.

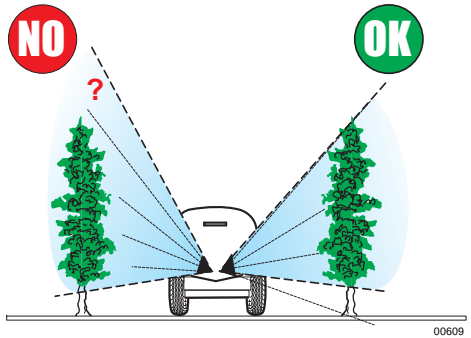




VERTICAL ADJUSTMENT.

The airflow must cover the whole of the surface to be treated, taking care that the target area is not missed.

- Vertically trim the lateral motion to eliminate the possible overspray.
- If necessary, close some of the diffusers should the coverage angle be too wide.

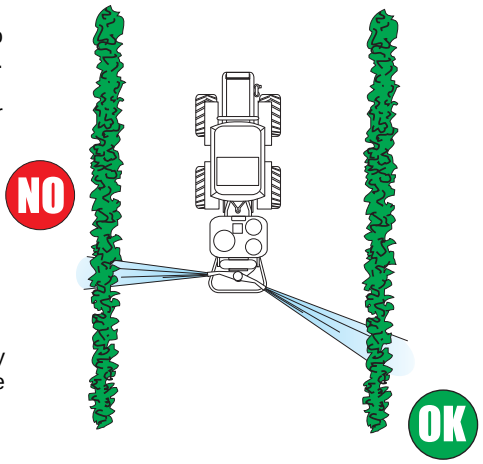


HORIZONTAL ADJUSTMENT

The air flow must cover the whole surface to be treated without straying from the target area.

In order to better penetrate the foliage, the air flow must strike the crop’s rows at an angle.

- Trim the angle of the sprayheads slightly towards the rear in order not to strike the crop perpendicularly.



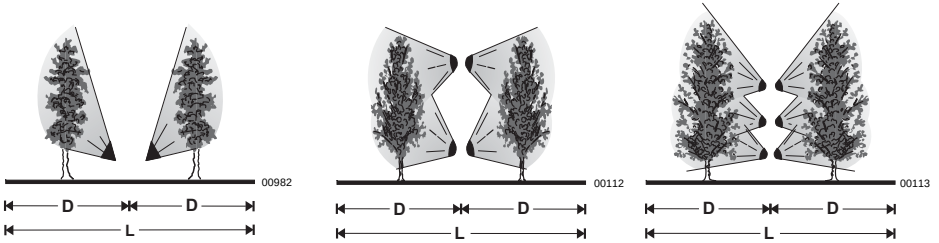
After having gained sufficient operative experience, the concentration of mixtures could be partially modified to gain and maximize all the advantages offered by a low-volume sprayer.

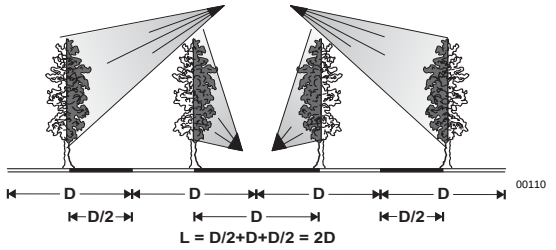
In fact, differing from what was initially indicated, the quantity calculated per hectare can be further reduced to 75% of that envisaged, without jeopardising the results of the intervention.
This reduction of the dosage is suggested to the agricultural operators who, with a proper understanding of the functional principles of this technique and its practical advantages and possibilities, will want to maximise the whole activity in the most convenient of ways. In order to clear the perplexity and fears that this new operative condition could give rise to, it is sufficient to consider **the different coverage modalities** respectively afforded by the treatment-applying systems.
Even when an adequate operative experience has been gained, it is in any case advisable to reduce the quantity of agro-chemicals with great care. It is always suggested that several tests on a limited piece of ground be carried out, initially reducing the quantity of agro-chemicals by 5÷10%, to then gradually increase this percentage.

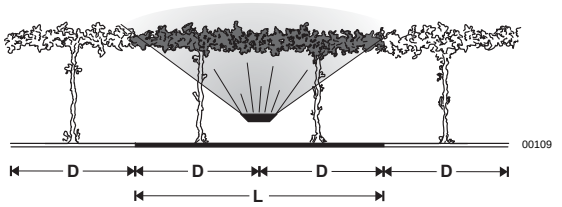
— When one operates with traditional, normal-volume machines, the quantity of mixture prepared for the intervention is utilised in an uneconomical way and without evaluating the possible negative consequences on the environment. In fact, by utilising this coverage technique, **one finds that on average 25% of the mixture employed is lost**, caused by its dripping on the ground and through dispersion due to over spray. It is evident therefore that, even in the traditional system, the treatment is carried out by distributing over the crop's surface only 75% of the mixture volume prepared, which corresponds to a quantity of active principle reduced by about 25% as related to that initially envisaged. The need for preparing a mixture volume exceeding the actual requirements of the crop derives solely from the coverage technique which, in order to distribute the vegetation with the necessary dose, in other words 75% of that quantity, it must inevitably disperse the remaining 25%. **"Of the 3 kg. of medicinal preparation per hectare indicated in the example therefore, only 2,250 grams (75%) will actually be sprayed on the plants, whereas the other 750 grams (25%) will be dispersed in the environment"**.

— **A correct use of our low-volume pneumatic equipment**, on the other hand, will eliminate this negative aspect and the deriving consequences. The essential characteristic of a low volume treatment is that of carrying out interventions **without the mixture dripping**. Should this happen it means that the spray atomiser is not being used to its utmost operative possibilities. The wide range of distribution devices that can be deployed on our machines also eliminate this dispersion effect. In fact, they make it possible to perform **"focused"** and **"specific" treatments** since the air flow can be adapted to the configuration of the crop's plants and distribution of the mixture, by utilising an appropriate distribution device (head), differentiated to match the actual needs of the different parts of the same plant. Since this affords an obvious economic advantage, the intervention system proposed allows the reduction of the dosage normally envisaged per hectare, amounting to the 25% which gets lost by "dripping" and by "overspray", without compromising the effectiveness of the coverage. The usefulness of this kind of operation is confirmed by the verification that both systems apply the coverage on the vegetation surface for 75% of the dose initially indicated.
"By reducing the 3 kg of agro-chemical per hectare, as considered in the example, by 25%, the mixture will have to be prepared with a dose of 2,250 GRAMS which will be completely distributed on the plants.

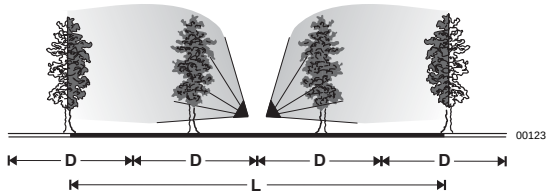
2 = TWO ROWS L = D x 2 = 3 x 2 = 6 metres
The width corresponds to a strip of ground which is as wide as double the distance between the rows. It requires a pass on a row, skipping the next, and so on.





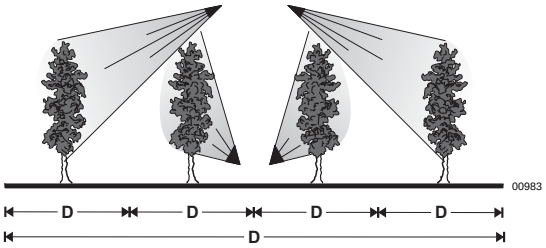


3 = THREE ROWS L = D x 3 = 3 x 3 = 9 metres
The width corresponds to a strip of ground which is 3 times as wide as the distance between the rows. It requires a pass on a row, skipping the next two.

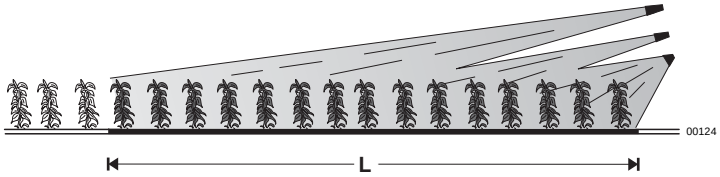


4 = FOUR ROWS L= D x 4 = 3 x 4 = 12 metres

The width corresponds to a strip of ground which is 4 times as wide as the distance between the rows. It requires a pass on a row, skipping the next three.



FULL LATERAL FIELD



The virtual width corresponds to the distance in metres actually covered by the spray.
Whoever utilises a sprayer for the first time is advised to determine the “width of the treatment” after having verified its coverage capability in practical terms. During the course of the season in fact, this width can vary according to the time of treatment: in certain crops the rows covered at the start of the growth cycle are more numerous than those covered during the period of maximum vegetation growth.

2 Travel speed “V”(km/h)

This represents the speed of the tractor-spray atomiser operative unit, during the carrying out of the treatment.

This must be **practically defined in field**, adapting it to the conditions of the ground, the crop planting system and the type of spray atomiser deployed. Furthermore, it is indispensable to select a gear matching the functional specifications of the machine. Normally, a speed lower than that utilised with traditional normal-volume equipment, will improve the quality and effectiveness of the treatment without reducing the operative capability.

THE TRAVEL SPEED IN km/h IS DERIVED FROM THOSE SPECIFIED FOR EVERY TRACTOR IN CORRESPONDENCE WITH THE GEAR SELECTED FOR THE TREATMENT.

7 Proportioning of the mixture

The quantity of agro-chemical to be employed in the preparation of the mixture must be calculated only according to the surface to be treated: INDEPENDENTLY OF THE TYPE OF EQUIPMENT USED OR OF THE LITRES OF WATER USED, EVERY HECTARE OF THE CROP ALWAYS NECESSITATES THE SAME QUANTITY OF PRODUCT BEING USED.

Considering that the surface of the crop on which the treatment is applied is normally always the same, it follows that in relation to the timing of the treatment, also the quantity of product to be utilised will not change and is equal to that utilised for the interventions carried out in the preceding seasons. The quantities of agro-chemicals needed per hectare therefore, constitute a value that can be considered constant and always known by whoever carries out the intervention.

By using our sprayers, the product necessary for the treatment can be distributed (see Point 4) with a greatly reduced volume of water if compared with that used with traditional, normal volume equipment. This implies that the preparation of concentrated mixtures and the concentration will be inversely proportional to the quantity of water decided upon for the intervention.

The following is an explanatory example for the preparation of the mixture, with the hypothesis of applying the treatment to a hectare of crop on which 3 kg of product were always used:

TRADITIONAL, NORMAL VOLUME MACHINE

with 3 kg of product in 1000 litres / ha = 300 g of product for every 100 litres of water

LOW-VOLUME PNEUMATIC SPRAYER

with 3 kg of product in 400 litres / ha = 750 g of product for every 100 litres of water,
with 3 kg of product in 300 litres / ha = 1000 g of product for every 100 litres of water,
with 3 kg of product in 200 litres / ha = 1500 g of product for every 100 litres of water
with 3 kg of product in 100 litres / ha = 3000 g of product for every 100 litres of water

By turning the knob, one can gradually shift from the minimum pressure value through to the maximum. The pressure values are visualised by the specific gauge.

In order to increase the agitation action it is advisable to also utilise the **pneumatic agitator**, adding an anti-foaming product to the mixture, if necessary.

The **ROTATING DISCS** are provided with 15 numbered calibrated holes which, for every operating pressure value selected, allow the utilisation of the machine with 15 different treatment rates.

Every distribution device (head) is endowed with a number suitable of rotating disc and is accompanied by a "OPERATION AND MAINTENANCE MANUAL" in which the DELIVERY CAPACITY TABLE lists 15 delivery capacities corresponding to several pressure values.
Only the values providing a delivery capacity range able to satisfy all the possible operative requirements are taken into consideration.

In view of the above aspects, THE ADJUSTMENT OF THE SPRAYER MUST BE CARRIED OUT BY FOLLOWING THE INSTRUCTIONS PROVIDED HEREUNDER:

A: calculate the HOURLY DELIVERY CAPACITY "Q" (see previous point 5)

B: define the PRESSURE with which it is intended to carry out the treatment.
Suggested values:

C: from the DELIVERY CAPACITY TABLE included in the OPERATION AND MAINTENANCE MANUAL of the DISTRIBUTION HEAD, in correspondence with the above-mentioned PRESSURE DELIVERY values, decide on the hole to be used and position all ROTATING DISCS on the corresponding number.

D: start the sprayer and let the tractor Power Takeoff rotate at a speed rate of 540 r.p.m. (treatment speed rate).

E: Rotate the knob of the REGULATOR until the GAUGE shows the pressure value defined at point B, with the **DISTRIBUTOR** (either manual or electric) **open**, then start the treatment.

THE TREATMENT MUST BE CARRIED OUT AFTER HAVING ACCURATELY PERFORMED THE CALIBRATION AND ADJUSTMENT OF THE SPRAYER ACCORDING TO THE ABOVE-MENTIONED PROCEDURE.

For information purposes it is specified that, if the length "ℓ "of a row in metres (m) is known, and by calculating time " t " taken to travel along it in seconds (s), it is possible to verify or calculate the travel speed. It will be sufficient to use the following formula:

$$V = \ell \times 3{,}6 : t = (km/h)$$

(length of the row in metres, multiply by 3.6 and divide by the progress time in seconds).

It is important to highlight the affect of the travel speed on the performance of the treatment. A correct intervention requires that the rows of vegetation should be penetrated by the mixture mist through to the centre (in this case the treatment will be applied to either side of the row), or by spraying the whole vegetation right through, thus penetrating completely through to the other side of the crop's row.

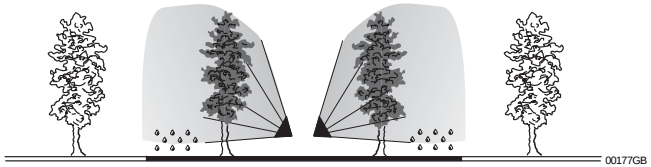
CORRECT MIXTURE PENETRATION

TREATMENT ON A ROW
HALF OF THE ROW'S DEPTH
ON EITHER SIDE

TREATMENT ON TWO ROWS
COMPLETE THROUGH SPRAYING
OF THE ROWS

If, after having passed through the vegetation, the mixture mist overshoots the row's profile excessively, some of the product will fall to the ground, thus polluting it.

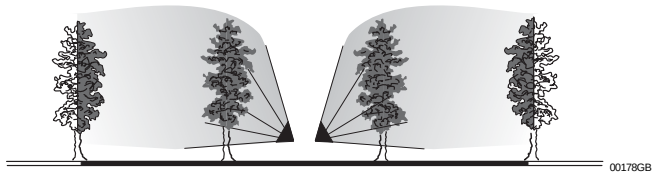
EXCESSIVE PENETRATION OF THE MIXTURE



FALLING OUT ON THE GROUND

This drawback can be eliminated by increasing the travel speed so as to reduce the airflow's penetration time within the row and to lower excessive overshooting of the mixture to within the required limits in order to avoid product dispersion. Alternatively, by reducing the travel speed, one can increase the airflow's penetration capacity so that the mixture mist can reach and penetrate the vegetation of the adjacent row.

CORRECT MIXTURE PENETRATION



TREATMENT ON THREE ROWS
COMPLETE THROUGH ACTION ON THE INTERNAL ROWS
HALF ROW ON EITHER SIDE FOR THE EXTERNAL ROWS

3 Work surface covered hourly “S” (ha/h)

It is the ground surface that encompasses the crop covered within one hour of actual treatment.

Dead times’ for the preparation, reloading, transfer and others are not taken into consideration.

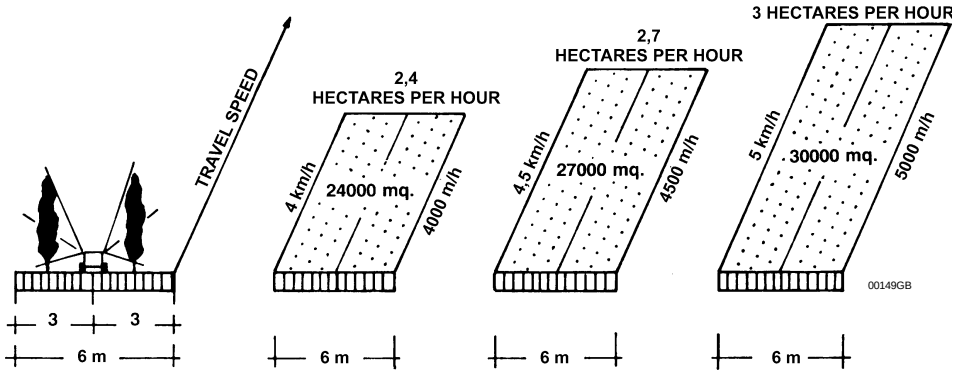
Quite easy to determine, this parameter is obtained through the two previously drawn. It is of fundamental importance since only by knowing the exact work surface covered hourly, it is possible to calculate the quantity of water that the sprayer can spray in an hour to carry out the treatment with the litres selected per hectare. Summarising, in order to define how many hectares of ground can be worked in an hour, it is sufficient to apply the following formula:

S = L x V : 10 = (ha/h)

BY MULTIPLYING THE WIDTH OF THE TREATMENT IN METRES “L”, BY THE TRAVEL SPEED “V” IN KILOMETRES/HOUR, DIVIDED BY TEN, THE SURFACE WORKED PER HOUR IS OBTAINED.

It is evident that, by keeping the WIDTH OF THE TREATMENT “L” for the treatment unchanged, the SURFACE WORKED PER HOUR “S” will vary with the increase or reduction of the speed.
On a crop with inter-rows distance “D” of 3 metres, where with every pass 2 rows are covered, WIDTH OF THE TREATMENT of 6 metres (3 m x 2) remains unchanged, whereas the SURFACE WORKED PER HOUR changes with the changing of the TRAVEL SPEED “V”, selected for the treatment in point:

if V = 4 km/h S = 6 x 4 : 10 = 2,4 ha/h worked
if V = 4,5 km/h S = 6 x 4,5 : 10 = 2,7 ha/h worked
if V = 5 km/h S = 6 x 5 : 10 = 3 ha/h worked



4 Litres to be delivered per hectare “W” (l/ha)

After having defined the previous parameters it is necessary to establish how many litres of water must be used in order to treat one hectare.

This selection, which is only limited to the condition that it should ensure crop coverage, is at the user’s discretion and operative capabilities. As far as this aspect is concerned the deployment selections can satisfy any requirement, even the most demanding.

Normally a rational use of our sprayers requires 1/4, 1/5 and, if so wished, even 1/10 of the volumes necessary for a traditional normal-volume machine.

As an indication, for one hectare of normal orchard, quantities of around 300/500 litres can be used, whereas for a vineyard it is possible to descend to volumes of 100/200 litres. Obviously, these data represent an average of the values normally used. The selection of volumes to be used per hectare, as a matter of fact, depends on the structure of the trees, the extent of their foliage and the climatic conditions prevailing at the time of intervention. In the presence of high environmental temperatures, it is not advisable to select excessively low volumes.

Finally and should this become necessary, with our sprayers it is also possible to apply selections that afford normal-volume treatments.

5 Hourly delivery capacity “Q” (l/h)

It represents the amount in litres of water that the sprayer must spray in an hour in order to carry out the treatment with the volume of mixture defined per hectare “W”.

With the indications provided thus far, this parameter has already been substantially defined.

By multiplying the HECTARES WORKED IN AN HOUR “S” (point 3) by the LITRES DEFINED PER HECTARE “W” (point 4) the HOURLY DELIVERY CAPACITY “Q” (l/h) is obtained, according to which the sprayer will be adjusted.

Q = S x W = (l/h)

6 Adjustment of the sprayer

Before continuing with these information notes, it would be appropriate to state that all our sprayers are equipped with an adjustment system made up of a PRESSURE REGULATOR and by ROTATING DISCS with 15 calibrated holes through which it is possible to deliver the pre-set quantities of mixture, at a predefined pressure. This technical device guarantees treatments with delivery capacity values corresponding to those specified.

The **REGULATOR** allows the manual adjustment of the sprayer so as to obtain the pressure value with which it is intended to carry out the treatment, normally between 1.2 and 2.5 atmospheres.

By rotating the specific knob in a clockwise direction:
— the operating pressure is increased
— the delivery flow utilised for the treatment is increased

Alternatively, by rotating the specific knob in an anticlockwise direction:
— the operating pressure is reduced
— the delivery flow utilised for the treatment is reduced.