THE REGULATION OF FLOW THROUGH RESIDUAL SPRAY NOZZLES

1. Metering Orifices in Polyethylene Discs *

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SYNOPSIS

Used residual spray nozzles, which have been discarded because of the increase in discharge rates, may be used again if their discharge rates are reduced by a metering orifice placed in the nozzle tip. A suitable orifice in a polyethylene disc is described. On the basis of laboratory test results, such a disc appears to be an inexpensive and satisfactory metering device for use in combination with worn spray nozzles.

The nozzle tip is one of the most important elements in a malaria control residual spray programme. Through it is forced insecticide with a monetary value many times the value of the tip. Inaccuracies in its rate of delivery can result in underdosage which may endanger the success of the programme or in overdosage which wastes insecticide. A nozzle tip delivering an excess of insecticide multiplied by hundreds on a national programme can waste a staggering sum of money. Also important is the nozzle tip which gives an uneven pattern of insecticide on the treated surface, with some areas overdosed and others with little, if any, insecticide. Such "bare" spots offer an opportunity for the infected vector to escape the barrier and complete the cycle of malaria transmission.

The erosion of nozzle orifices by particulate matter in water-dispersible insecticides has been measured for tips of brass (unpublished data). The very rapid erosion of this soft metal forced manufacturers to produce tips of stainless steel and, later, of hardened stainless steel. The rates of erosion of nozzle orifices in these metals showed progressive improvement, but even the best of the nozzle tips eroded at a rate which required frequent replace-

* This study was carried out as part of a contractual agreement between the Communicable Disease Center and the International Cooperation Administration.
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ment. The rather high cost of the better tips, although only a small fraction of the cost of the insecticide, militates against replacement. Thus, a search for better nozzle tips has been under way for some years.

Orifices in semi-precious stones have been offered by manufacturers, but only of a circular configuration which will not provide the spray pattern required for malaria control work. Ceramic nozzle tips, available on the market for other purposes, have given promise of resistance to erosion, but none has been found to date which will produce an acceptable spray pattern. The production in quantity of ceramic tips with a more satisfactory orifice configuration has presented serious technical problems, but offers a promising future.

It has been pointed out by Knipe\(^1\) that orifices made of polyethylene erode at a rate no greater than those of stainless steel and that nozzle tips might profitably be made of that material. It remains to be seen, however, if polyethylene or other plastic tips would be fully suitable for field use where the possibility of heat and mechanical damage is present.

In a search for an answer to this problem, at least until nozzle tips of a very hard material can be produced commercially, one of us (R.P.L.) suggested the use of a secondary metering orifice in the nozzle tip to reduce the flow through an eroded orifice.

To test this possibility, two stainless steel 8002 nozzle tips\(^2\) with a polyethylene orifice disc placed behind each of them, as shown in Fig. 1,

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\(^{1}\) Knipe, F. W. (1957) Bull. Wld Hlth Org., 16, 211

\(^{2}\) Manufactured by the Spraying Systems Company, Bellwood, Ill. These same nozzle tips had previously been erosion-tested (without the polyethylene discs) with suspensions of 1.3% water-wettable dieldrin for approximately 300 hours
were subjected to erosion-testing for approximately 100 hours with 5% test suspensions of 75% water-wettable DDT. The testing was performed by means of the device described by Hall. The test suspensions in the apparatus were changed every four hours, and a constant nozzle discharge pressure of 25 pounds per square inch (p.s.i.) (1.76 atm.) was maintained throughout the test period.

The discs tested were made from 0.090 inch (2.29 mm) thick sheet polyethylene. The outside diameter of the discs was 0.610 inch (15.49 mm) and the orifice was cored in the centre of the disc by a blunted No. 18 gauge hypodermic needle revolving in a jeweller's drill press. The resulting orifice had a diameter of 0.0375 inch (0.95 mm). The upstream side of the orifice was countersunk with a 60° reamer to a depth of 0.040 inch (1.02 mm).

Discharge measurements and spray patterns were determined for both nozzle tips, before and after the test run, and with and without the orifice disc. The resulting data are shown in the table below and in Fig. 2.

<table>
<thead>
<tr>
<th>Nozzle condition for discharge rate determination</th>
<th>Average discharge rate ** at 25 p.s.i. p.g. nozzle discharge pressure for two stainless steel 8002 nozzles (ml/minute)</th>
<th>percentage increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>With polyethylene orifice disc</td>
<td>529.5</td>
<td>531.8</td>
</tr>
<tr>
<td>Without polyethylene orifice disc</td>
<td>662.5</td>
<td>675.3</td>
</tr>
</tbody>
</table>

* The nozzle discharge pressure was 25 p.s.i. and the test suspensions were changed every four hours.
** The discharge rates were determined with water.

These data indicate that the polyethylene disc can satisfactorily be used as a metering device for stainless steel spray nozzles discharging suspensions of water-wettable DDT. In general, the spray angle is slightly reduced by the introduction of the metering orifice into the stream, and the spray pattern may even be improved. Further, the combination of disc and nozzle tip maintains the initial discharge rate for many hours of spraying. There was only a 0.45% increase in the discharge rate for the combination during the test period, whereas for the nozzle tip alone the increase was 1.9%.

The results of this study suggest that a polyethylene metering orifice in combination with the stainless steel nozzle at present available may at this time be a more practical and economical solution to the problem of nozzle

\footnote{Hall, L. B. (1955) Bull. Wild Hlth Org., 12, 392.}
tip erosion than either the frequent replacement of stainless steel tips or the use of tips made of polyethylene instead of stainless steel. Experience indicates that the discs could be moulded in quantity, by standard techniques, with the orifice sized to an accuracy of ±0.001 inch (0.025 mm) (C. S. Blackwell—personal communication, 1957). With special moulding techniques, they could be produced to an accuracy of ±0.0005 inch (0.012 mm). Even produced to the latter tolerance, marked and packaged, their cost in quantity should not exceed US $0.02 each.

The authors suggest that the discs could be supplied in the field, each individually packed in a Cellophane envelope marked with the orifice size. Each disc should also have the orifice size in characters moulded on its surface. Several sizes, estimated at not more than ten, should be available. Upon detection by the supervisor of an increase in the discharge rate, the rate could be brought back to its original value by insertion of a polyethylene orifice of appropriate size in the nozzle. This orifice could be discarded and replaced by a new one of the same or a smaller size when the discharge rate again becomes excessive. It is believed that, by means of studies extending over longer test periods, a schedule for orifice use and replacement could be established which would require a minimum of flow measurement in the field.
By the use of metering orifices in polyethylene discs, the present life of new stainless steel nozzles and those that are now in use in the field could be extended. Many of the stainless steel nozzles that have been set aside because of increased discharge rates could be used again when combined with a polyethylene metering disc of suitable size. At the same time, the advantages possessed by the metal tips in current use, of high mechanical strength and good spray pattern, could be retained.

RÉSUMÉ

Pour bien des raisons, les becs de buse des pulvérisateurs, dans la lutte contre le paludisme, ont retenu l’attention des ingénieurs sanitaires: si leur débit est excessif, des quantités importantes d’insecticide peuvent être perdues; s’il est irrégulier, les surfaces non atteintes au moment du «passage à vide» des pulvérisateurs sont singulièrement dangereuses. Les becs de buse en cuivre ont dû être abandonnés du fait de leur usure trop rapide, les becs en acier inoxydable, même les meilleurs, doivent être changés fréquemment pour la même raison, et les becs en céramique ne représentent pour le moment qu’un espoir, sérieux il est vrai. Les auteurs ont donc pensé qu’au lieu de remplacer les becs en acier inoxydable usés, il devait être possible de les recalibrer en plaçant à l’intérieur un disque de polyéthylène perforé. Un disque épais de 2,29 mm et percé en son centre d’un orifice de 0,95 mm de diamètre, a été soumis à une épreuve d’érosion de 100 heures. Un bec en acier inoxydable dépourvu de disque a été soumis à la même épreuve. Dans le premier cas, le débit n’avait augmenté après 100 heures, que de 0,45%. Dans le second cas l’augmentation était de 1,9%. Economique, de fabrication aisé, le disque en polyéthylène permettrait d’utiliser à nouveau les becs de buse en acier inoxydable déjà usés et de prolonger sérieusement la durée d’utilisation des becs neufs.
THE REGULATION OF FLOW THROUGH RESIDUAL SPRAY NOZZLES

2. Flow Control Orifices in Soft Rubber Discs

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SYNOPSIS

A sharp-edged orifice in a disc of rubber with a durometer tolerance of 35 to 40, properly mounted near the nozzle tip, is capable of regulating the discharge from a compression sprayer with an accuracy at least comparable to that of mechanical pressure regulator valves. The orifice can act as a flow control device under varying hydraulic pressures because of reduction of the diameter and change of the shape of the orifice under the fluid pressure on the upstream face of the disc. This is possible since, to maintain a constant rate of discharge, the diameter of the orifice need only be changed inversely as the fourth root of the pressure and the square root of the coefficient of discharge. Erosion of the orifice and "set" of the rubber, two potential causes of inaccurate flow, tend to cancel each other out.

The device is best used in combination with an 8003 nozzle tip. The rubber discs can be produced commercially at a reasonable cost. Field trials of the combination are recommended.

The studies by the authors of metering orifices in polyethylene discs (see preceding article) suggested that a metering orifice in a material softer than polyethylene might be used as a flow control device.

To determine this possibility, a metering orifice in a pure gum-rubber disc was investigated. This orifice had a straight wall diameter of 0.050 inch (1.27 mm), and was cored in the centre of a disc 1/16 inch (1.59 mm) thick and 0.610 inch (15.5 mm) in diameter. The rubber was type L07 and had a durometer tolerance of 35 to 40. When this orifice disc was placed behind a stainless steel 8003 nozzle tip in a conventional nozzle holder and connected to a pressurized sprayer tank, it was found that the discharge rate

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* This study was carried out as part of a contractual agreement between the Communicable Disease Center and the International Cooperation Administration.

1 Manufactured by the Spraying Systems Company, Bellwood, Ill.
FIG. 1. ORIFICE SIZE IN GUM-RUBBER ORIFICE DISC AT VARIOUS TANK PRESSURES (APPROXIMATE MAGNIFICATION: \( \times 10.5 \))

A. Tank pressure: 0 p.s.i.g.
   Orifice diameter: 0.050 inch (1.27 mm)

B. Tank pressure: 20 p.s.i.g. (1.41 atm.)
   Orifice diameter: 0.047 inch (1.19 mm)
   Coefficient of discharge: 0.60

C. Tank pressure: 30 p.s.i.g. (2.11 atm.)
   Orifice diameter: 0.042 inch (1.07 mm)
   Coefficient of discharge: 0.71

D. Tank pressure: 40 p.s.i.g. (2.81 atm.)
   Orifice diameter: 0.035 inch (0.89 mm)
   Coefficient of discharge: 0.81

E. Tank pressure: 50 p.s.i.g. (3.52 atm.)
   Orifice diameter: 0.029 inch (0.74 mm)
   Coefficient of discharge: 0.95

F. Tank pressure: 55 p.s.i.g. (3.87 atm.)
   Orifice diameter: 0.027 inch (0.69 mm)
   Coefficient of discharge: 0.93
of the nozzle remained relatively constant even though tank pressure dropped from 55 (3.87 atm.) to 20 pounds per square inch gauge pressure (p.s.i.g.) (1.41 atm.).

Observations of the rubber disc showed that the orifice was smaller at higher tank pressures and larger at lower pressures. The closing of the orifice appeared to be due to compression of the rubber in the disc under the force of the fluid pressure on the upstream face of the disc. A smaller and differently shaped orifice resulted. The photographs in Fig. 1 show the orifice sizes that occur at different tank pressures.

The action of this simple automatic flow control device is explained by the following equation in hydraulics:

\[ Q = CA \sqrt[4]{4.62 gp} \]

where

- \( Q \) = discharge rate in cubic feet per second
- \( C \) = coefficient of discharge
- \( A \) = cross-sectional area of the orifice in square feet
- \( g \) = acceleration of gravity = 32.2 feet/sec/sec.
- \( p \) = fluid pressure on orifice in pounds per square inch.

In the above formula, \( A = \frac{D^2}{4} \), where

\( D \) = diameter of the orifice in feet.

Then \( D = \frac{0.325 Q^{\frac{1}{4}}}{C^{\frac{1}{4}} p^{\frac{1}{4}}} \).

If \( D \) is the diameter of the orifice in inches and \( Q \) is the flow in ml/minute,

then \( D = \frac{(0.002975) (Q^{\frac{1}{4}})}{C^{\frac{1}{4}} p^{\frac{1}{4}}} \).

Accordingly, if the discharge rate (Q) is to remain constant, then the diameter of the orifice need only be changed inversely as the fourth root of the pressure and the square root of the coefficient of discharge. Therefore a relatively large change in tank pressure will require only a small change in orifice diameter in order to keep Q constant. Since the coefficient of discharge should range between 0.5 and 1.0, it will have but small influence on Q.

To verify the above consideration, orifice diameters were measured by means of the device shown in Fig. 2. These measurements were made with an ocular micrometer when discharge was taking place through the rubber orifice. A new stainless steel 8003 nozzle was on the outlet side of the device. The measurements were made at each 5 p.s.i.g. (0.35 atm.) pressure increment between 20 and 55 p.s.i.g. (1.41 and 3.87 atm.) tank pressure. Also, discharge measurements for the 8003 nozzle were made

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FIG. 2. DEVICE FOR MEASURING ORIFICE DIAMETERS IN GUM-RUBBER ORIFICE DISC DURING DISCHARGE
simultaneously with the disc orifice measurement for each pressure increment. Discharge coefficients were calculated on the basis of the measurements. It was found that the orifice diameter and the coefficient of discharge ranged from 0.047 inch (1.19 mm) to 0.027 inch (0.69 mm) and from 0.60 to 0.93, respectively, at 20 p.s.i.g. and 55 p.s.i.g. tank pressure. These data are shown with the photographs in Fig. 1. The differences in discharge coefficients that were found are what might be suspected, since the shape of the orifice changes under increasing pressure from a sharp-edged clean-cut hole to one that is rounded. The resulting combination of "small" discharge coefficients with "large" orifice diameters at low tank pressures and "large" discharge coefficients with "small" orifice diameters at high tank pressures accounted for the relative degree of flow control that was achieved by the rubber orifice disc.

The variation in nozzle discharge rate from an ideal rate\(^1\) of 0.2 US gallon (0.75 litre) per minute is shown in Fig. 3 for the 8003 nozzle com-

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\( ^1 \) US Public Health Service, Tennessee Valley Authority (1947) Malaria control on impounded water, Washington, D.C.
TABLE 1. VARIATION IN NOZZLE DISCHARGE RATE FROM IDEAL RATE OF 0.2 US GALLON PER MINUTE DURING SPRAYING OF 0.75 US GALLON (ABOUT 3 LITRES) OF LIQUID

<table>
<thead>
<tr>
<th>Percentage variation from 0.2 gallon per minute</th>
<th>Percentages of spraying time at each discharge range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to ± 10</td>
<td>8002 nozzle without flow control device</td>
</tr>
<tr>
<td>± 11 to ± 20</td>
<td>8003 nozzle with rubber orifice disc</td>
</tr>
<tr>
<td>± 21 to ± 30</td>
<td>8003 nozzle with constant pressure discharge valve</td>
</tr>
<tr>
<td>37.0</td>
<td>89.0</td>
</tr>
<tr>
<td>33.0</td>
<td>11.0</td>
</tr>
<tr>
<td>30.0</td>
<td>0.0</td>
</tr>
<tr>
<td>33.0</td>
<td>30.0</td>
</tr>
<tr>
<td>30.0</td>
<td>0.0</td>
</tr>
<tr>
<td>44.4</td>
<td></td>
</tr>
</tbody>
</table>

* During the spraying the tank pressure dropped from 55 to 20 p.s.i.g. The total tank volume was 3 US gallons (about 11 litres) and the liquid content before discharge was 2.25 US gallons (about 8.5 litres).

bined with the rubber orifice disc. Also shown are the variations in nozzle discharge rate for the same nozzle without the rubber disc but with a constant pressure discharge valve, and for an 8002 nozzle without any flow control device. Observation of the three curves shows a maximum error for the 8002 nozzle without control. The curve for the 8003 nozzle with the constant pressure discharge valve crosses the line of the ideal at the 90 % discharge value. By adjustment of the valve this could have been made to cross nearer the 50 % value, but the total deviation from the ideal

FIG. 4. BRASS ADAPTER FOR HOLDING RUBBER ORIFICE DISC

![Diagram of Brass Adapter and Rubber Orifice Disc](image-url)
would not have been improved. The curve of deviation for the discharge of the 8003 nozzle with the rubber orifice disc is found on both sides of the ideal value, but its total deviation may be compared favourably with that of the mechanical pressure discharge valve and is far superior to the unregulated discharge of the 8002 nozzle. Table 1 summarizes the comparisons made in Fig. 3.

Although the combination of 8003 nozzle and rubber orifice disc gave good discharge rate control, it was found that: (a) the resulting spray patterns were poor and somewhat unpredictable; (b) the discharge rate depended upon how much the disc was compressed between the nozzle body and the nozzle tip by the nozzle cap nut. Also, (c) data were needed on the erosion of the rubber orifice by the passage of water-dispersible insecticides.

Each of these points was investigated. Problems (a) and (b) were solved by making an adapter which held the rubber disc a short distance away from the back of the nozzle tip. This adapter is shown in Fig. 4. The design of the adapter permitted the disc to be centred but not restrained in any dimension. This is an important feature, for mechanical compression of

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**FIG. 5. COMPARISON OF SPRAY-PATTERN DISTRIBUTION CURVES FOR TWO STAINLESS STEEL 8003 NOZZLE TIPS WITH AND WITHOUT RUBBER ORIFICE DISCS: BEFORE EROSION TESTING**

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* The spraying height was 18 inches (46 cm) and the discharge pressure on the upstream face of the disc or nozzle was 25 p.s.i.g. (1.76 atm).
the disc in any plane may result in "set" of the rubber with corresponding semi-permanent changes in the characteristics of the orifice. Thus, to accommodate the disc in the adapter, the outside diameter of the disc was reduced to 0.530 inch (13.46 mm). The orifice diameter was increased to 0.067 inch (1.70 mm), since the taper in the seat of the adapter was enlarged over the taper at the back of the nozzle tip. The resulting spray patterns with the disc in place and removed are presented in Figs. 5 and 6. These figures show satisfactory patterns for the disc-nozzle combination.

FIG. 6. COMPARISON OF SPRAY-PATTERN DISTRIBUTION CURVES FOR TWO STAINLESS STEEL 8003 NOZZLE TIPS WITH AND WITHOUT RUBBER ORIFICE DISCS; AFTER EROSION TESTING WITH 5% SUSPENSIONS OF DDT PREPARED FROM 75% WATER-WETTABLE DDT*

* The spraying height was 18 inches (45 cm), the discharge pressure on the upstream face of the disc or nozzle was 25 p.s.i.g. (1.76 atm.), and the suspensions were changed every four hours during a 24-hour test period.

The erosion characteristics of the orifice in the disc were determined by testing the disc in a laboratory erosion-testing apparatus. Test suspensions of 5% DDT made from 75% water-wettable DDT concentrate were recirculated through the orifices. Four stainless steel 8003 nozzles were tested simultaneously. Two nozzles were tested in combination with the rubber disc mounted in the adapter and the other two nozzles were tested as controls without the rubber disc. The erosion test was for a 24-hour period. The test suspensions were changed every four hours and the inlet
TABLE 2. EFFECT OF EROSION ON DISCHARGE RATES OF STAINLESS STEEL '8003 NOZZLES WITH AND WITHOUT RUBBER ORIFICE DISCS, WHEN 5% SUSPENSIONS OF DDT PREPARED FROM 75% WATER-WETTABLE DDT POWDER WERE RE-CIRCULATED THROUGH THEM FOR A PERIOD OF 24 HOURS AT AN INLET PRESSURE OF 25 p.s.i.g.

<table>
<thead>
<tr>
<th>Sprayer tank pressure (p.s.i.g.)</th>
<th>Discharge rates before and after test period (ml/minute) *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rubber disc alone ml</td>
</tr>
<tr>
<td>20</td>
<td>683.1</td>
</tr>
<tr>
<td>25</td>
<td>644.2</td>
</tr>
<tr>
<td>30</td>
<td>627.5</td>
</tr>
<tr>
<td>35</td>
<td>610.4</td>
</tr>
<tr>
<td>40</td>
<td>624.7</td>
</tr>
<tr>
<td>45</td>
<td>622.1</td>
</tr>
<tr>
<td>50</td>
<td>667.7</td>
</tr>
<tr>
<td>55</td>
<td>718.1</td>
</tr>
<tr>
<td>Average</td>
<td>654.7</td>
</tr>
<tr>
<td>Percentage difference</td>
<td>+3.33</td>
</tr>
</tbody>
</table>

* The discharge measurements were made with water at room temperature and by gravimetric means. The data in each column represent the average of two discs or two nozzles.

Pressure on the disc (or nozzle) was maintained at 25 p.s.i.g. (1.76 atm). The erosion taking place was determined by separate discharge measurements, before and after the test period, of the discs alone, nozzles and disc together, and the nozzles alone. Also, the inlet and outlet diameters of the disc orifice were measured before and after the test period. Tables 2 and 3 present these measurements. These data showed that slight changes may have occurred, probably owing to the mechanical and hydraulic compression of the disc used in this test. Spray distribution patterns made after the erosion test period were satisfactory (Figs. 5, 6, 7).

TABLE 3. ORIFICE DIAMETER MEASUREMENTS BEFORE AND AFTER EROSION TESTING WITH RE-CIRCULATED 5% SUSPENSION OF DDT PREPARED FROM 75% WATER-WETTABLE DDT POWDER

<table>
<thead>
<tr>
<th>Test time</th>
<th>Diameter of orifice (inches) *</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>inlet side</td>
</tr>
<tr>
<td>0 hours</td>
<td>0.0675</td>
</tr>
<tr>
<td>24 hours</td>
<td>0.0677</td>
</tr>
</tbody>
</table>

* The measurements represent the average of two orifices.
To examine further the factors of erosion and "set", a new rubber orifice-disc was combined with the 8003 nozzle tip previously used, but the disc was held in the adapter shown in Fig. 4. Thus the disc was not subjected to mechanical compression. To reduce hydraulic compression of the disc to a minimum and to simulate field practice as closely as possible, the erosion study was carried out on a cut-off valve durability tester. With this arrangement the orifice disc was subjected to on-off cycles of pressure such as would be encountered in actual operations. The results are shown in Table 4. The number of cycles was 7000, although the total volume of insecticide passing through the assembly amounted to only 29.6 US gallons (about 112 litres). Nevertheless the data suggest that at least two changes might have occurred: (a) erosion of the nozzle tip tending to an increase in the discharge; and (b) "set" of the rubber disc under hydraulic compression, perhaps combined with erosion of the orifice, but with an over-all reduction of discharge. The combined action upon the orifice in the nozzle tip and the orifice in the rubber disc appeared to balance out to maintain a rather uniform rate of discharge.

TABLE 4. CHANGES IN VOLUME OF DISCHARGE OF A STAINLESS STEEL 8003 NOZZLE TIP AND A RUBBER ORIFICE DISC WHEN TESTED UNDER CONDITIONS OF INTERMITTENT FLOW

<table>
<thead>
<tr>
<th>Number of test cycles</th>
<th>Discharge rate with water at 25 p.s.i.g. (ml/minute)</th>
<th>Estimated quantity of 5% DDT suspension sprayed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>nozzle-disc</td>
<td>nozzle alone</td>
</tr>
<tr>
<td>0</td>
<td>794</td>
<td>936</td>
</tr>
<tr>
<td>2500</td>
<td>794</td>
<td>937</td>
</tr>
<tr>
<td>7000</td>
<td>792</td>
<td>948</td>
</tr>
</tbody>
</table>

These results suggest that the rubber orifice disc will serve as an automatic flow control device for residual spray nozzles. Because of the simplicity of the device and its apparent freedom from the disadvantages that have been encountered in the field with its mechanical counterpart, it is believed that the disc can be recommended for field trial. When field evaluation is undertaken, it is suggested that the device be used in combination with stainless steel 8003 nozzle tips. This would permit discharge rates closely approaching the ideal discharge rate of 0.2 US gallon (0.75 litre) per minute without the danger of over- or under-treatment of surfaces. It is expected that the cost of the discs in bulk will be reasonable and that close tolerances in their manufacture can be obtained (R. C. Wells—Personal communication, 1957).

RÉSUMÉ

L'intérêt des disques en caoutchouc pour calibrer les becs de buse des vaporisateurs de poudre mouillable de DDT, réside dans le fait que l'orifice central du disque est capable à lui seul de régulariser le débit avec une précision semblable à celle d'une soupape mécanique. Les variations de diamètre de l'orifice suivant les variations de pression permettent cette régulation: si la pression est forte, le diamètre diminue; si la pression est faible, le diamètre augmente. Pour améliorer les plages d'aspersion du jet et le débit de ces disques en caoutchouc, les auteurs ont mis au point un embout dans lequel le disque est sorti, embout qu'on adapte au bec de buse. Les meilleurs résultats sont obtenus en utilisant cet embout et son disque avec un bec de buse 8003: on obtient ainsi un débit voisin du débit idéal de 0,75 litres par minute. La production commerciale de ces disques en caoutchouc est bon marché.