

ENVIRONMENTAL IMPACT OF PESTICIDES

PRACTICAL EXERCISE

LABORATORY REPORT

**TITLE OF EXPERIMENT:** APPLICATION OF CROP PROTECTION CHEMICALS

 Submitted By:

 Valens Habimana

 Okorie Julius Eberechukwu

**Supervisor**: Ir. Michael Houbraken

1. **INTRODUCTION**

In agricultural food production, positive results can be obtained by using appropriate pesticides through the application of appropriate methods. Different equipments exist and depending on nozzles types you have different sprayings, a nozzle is a critical part of any sprayer, the role of nozzle is to regulate flow, atomize the mixture into droplets, and disperse the spray in a desirable pattern [1]

The big droplets are not taken by wind and small droplets are easily taken by wind. The choice of nozzles is important in avoiding the drift, nozzles are generally best suited for certain purposes and less desirable for others. Nozzles determine the rate of pesticide distribution at a particular pressure, forward speed, and nozzle spacing. Drift can be minimized by selecting nozzles that produce the largest droplet size while providing adequate coverage [2]

Each nozzle on a sprayer should apply the same amount of pesticide. If one nozzle applies more or less than adjoining nozzles, streaking may occur. Nozzle flow rates need to be monitored by regularly collecting the flow from each nozzle under operating conditions and compare the output. The spray angle and the shape of the pattern are important. Narrow angles produce a more penetrating spray. Wide-angle nozzles can be mounted closer to the target, spaced farther apart on the boom, or provide overlapping coverage. Lower pressures produce larger droplets which reduce drift potential, higher pressures produce small drops for maximum plant coverage, but small drops are more susceptible to drift [3]

Different types of nozzles exist like flat fan (FF nozzles), Cone nozzles (the hollow cone and the full cone), deflector nozzles and air induction nozzles (A.I nozzles). Flat-Fan Spray Nozzles are widely used for broadcast spraying of herbicides and some insecticides, they produce a tapered-edge; flat-fan spray pattern, less material is applied along the edges of the spray pattern, so the patterns of adjoining nozzles must be overlapped to give uniform coverage over the length of the boom. Full cone nozzle gives most of the liquid in the middle of the cone and no need to overlap them [4]

The experiment was conducted to determine the effect of different nozzles and pressure on the spraying droplets. The results showed that the big nozzles and low pressure contribute to the big droplets while the small nozzles and high pressure gives small droplets.

1. **OBJECTIVE OF THE EXPERMENT**

The objective of this experiment was to acquire the knowledge on how the spraying of pesticides is performed, effect of nozzles and pressure on spray volume and droplets, and how to estimate the amount of pesticide to splay to the whole field by using an experiment.

1. **MATERIAL AND METH OD**

The equipments that have been commonly used to splay the pesticides include air plane spraying, hand sprayer, low pressure sprayer, air support spray, air blast sprayer and Knapsack or back sack sprayers. The air plane spraying is the spray by using the airplane, this method is not a good because do not target only plantation but can also contaminate the surrounding environment. For hand sprayer you have to spray in one direction, walk in the straight line and you don’t move your hand. The low Pressure Sprayer also called the spray boom has to stay in the same position to obtain a uniform coverage. A uniform coverage of trees, a uniform deposition on the trees results in a uniform protection. For air support spray, the airbag offers many advantages, including lower water quantity, optimal penetration into the crop, drift reduction and a possibility of saving of pesticides, air blast sprayer Move pesticide by creating wind, the challenge of this spray is the problem of drift by air.[3]

In this experiment we used the Knapsack or back sack sprayer which is suitable for small plantings; it is entirely manual and is carried on an operator's back. The solution that you all used had a concentration of 50,000.0 mg/L. 1 ml per liter was used to spray. 600 ml of this dilution was sprayed over 20 m². Everybody placed 3 plates somewhere on the 20m². The amount intercepted on these plates was diluted in 50 ml hexane and analyzed. The area of 1 plate was 0.006359m².

We started first by checking the walking speed, and the flow, we repeated 3 times by trying to walk at the same speed and checking the volume splayed, working at the same speed means the sprayed liquid will be the same. The small container was placed on the spraying nozzle to recuperate the sprayed liquid. The flow depends on spray nozzle and spray pressure used. A certain pressure was obtained by pumping with a hand. The choice of spray nozzle, at the end of the spray lance determines the sprayed volume.

1. **RESULTS**

Table1. Result of the standard use for the calibration curve

|  |  |
| --- | --- |
| AREA OF GC ANALYSIS (Hz\*s) | CONCENTRATION mg/l |
| 26.36 | 0.01 |
| 42.5 | 0.02 |
| 84.7 | 0.04 |
| 186.6 | 0.08 |
| 227.2 | 0.1 |
| 470.3 | 0.2 |
| 26779.9 | 1 |

Figure 1. Calibration curve of the standard

Table2. The amount of pesticides spray deposit

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 6m | 12m | 18m | Average | mg on the plate  | mg to on 20m2 | mg of original substance  |
| 0.276 | 0.103 | 0.2 | 0.193 | 0.010 | 30.339 | 0.607 |
| 0.286 | 0.347 | 0.203 | 0.279 | 0.014 | 43.833 | 0.877 |
| 0.428 | 0.272 | 0.386 | 0.362 | 0.018 | 56.879 | 1.138 |
| 0.38 | 0.350 | 0.272 | 0.334 | 0.017 | 52.544 | 1.051 |

1. **DISCUSSION**

The results shows that the amount splayed on Petri-dish was varying, this is because of the variation in the speed, 2 groups have slightly similar amount 56.879 mg and 52.544 mg. the speed is very important to obtain a uniform distribution of the pesticide. The variation is indicated also on the amount splayed on different Petri dish per each group, the first group splayed 0.103 mg on the second petri dish and a double on the third petri dish which is a big variation. Another factor that can results in this variation apart from the speed is the spray angle and the distance of the spray equipment to the dish that was not may be constant when the operator was spraying. This means that the experience in spraying and training are the basic elements that must be given to the people that are working in pesticide spraying in order to have the Good Agriculture Practice.

1. **CONCLUSION**

The experiment was a good experiment that shows the hands on the real practice that is happening on the field. The experiment was a good experiment to reinforce the theory seen during the class. The experiment showed that the better spray of pesticide is based on the types of the nozzles that you choose and choosing the correct parameters like pressure and the speed, the training and the experience is necessary as we started with the training and the results shows the variation in terms of the amount of the sprayed liquid and the sprayed amount of pesticide.

1. **REFERENCES**
2. Debear C, Broers N, Denruyter L, Jaeken P (2005). Effect of band spraying on deposit and biological efficacy in strawberries. VIII workshop on spray application techniques in fruit growing. Barcelona, Spain, p. 8
3. Panneton B, Philion H, Theriault R (1996). Spray chamber of air assisted spraying. ASAE Paper No. 96-1078, ASAE, St. Joseph, MI 49085
4. Taylor WA, Andersen PG (1989). The use of air-assistance in field crop sprayer to reduce drift and modify drop trajectories. Proc. Brighton Crop Prot. Conf. Weeds, 2: 631-639