

Report on a 2-Day Training Workshop on Application Techniques and Safe Use of Pesticides

organized by
IITA Cassava Weed Management Project and
Bayer CropScience

Date: 27-28 April, 2015

Venue: IITA, Ibadan



Alfred Dixon, Friday Ekeleme,
Olaitan Alloh, Godwin Atser, and Ezinne Ibe



Bayer CropScience

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Background

The Cassava Weed Management Project seeks to establish sustainable weed management technologies for cassava systems in Nigeria. The project's approach is to integrate various weed control technologies in a package that will be effective in the control of weeds. The project has five dimensions which are also known as objectives and the use of herbicides is one dimension. This training workshop on Application Techniques and Safe Use of Pesticides was organized with a view to equip participants with the knowledge/skills on safe use of herbicides. The aim is to improve the efficacy of herbicides applied on the field, and to safeguard the health of the applicator and the environment.

Participants from various institutions attended the training and the resource persons were Dr Mohamed Elsherif of Bayer CropScience, Germany; and Professor Friday Ekeleme, IITA. Godwin Atser was the facilitator. Representatives from three regulatory agencies: National Agency for Food and Drug Administration and Control (NAFDAC), Standards Organization of Nigeria (SON), and National Environment Research and Regulatory Enforcement Agency (NESREA) were in attendance. The three regulatory agencies also made presentations at the training.

Welcome Address by the Project Leader, Dr Alfred Dixon

In his welcome address, Project Leader, Dr Alfred Dixon expressed his pleasure to have the participants at the training. He elucidated the significance of the training while pointing out the quantitative and qualitative menace of weeds as a major constraint to agriculture. In Africa, he said, the menace is expressed in terms of significant crop loss for virtually all major crops including cassava which has up to 90% loss. Apart from failing to address the weed menace, the traditional manual weeding with hand-held hoes usually done by women and children has brought more negative implications on the home fronts, the children and the health of the women. If the alternative solution – the use of herbicides which has local and global acceptance, is to live up to its full advantage, there is need to acquaint stakeholders “with the safe use of this technology to be able to maximize its benefits”. He appreciated Bayer Crop Science for partnering with IITA Cassava Weed Management Project.



Dr Dixon (putting on a hat)

Training Sessions

Session 1

“Application Challenge for Herbicide Application” by Dr Mohamed Elsherif

Introduction

Dr Mohamed Elsherif introduced this session with words of appreciation to the IITA Cassava Weed Management Project team for the opportunity given him to teach people on application techniques and safe use of pesticides. He said his focus would be on herbicides which are also pesticides. “This session would talk about the challenge that is faced in the course of using herbicides,” he emphasized.

What is the Challenge?

“The challenge is the challenge of application and it is critical. Overcoming it will translate to successful and beneficial use of herbicides” he noted. Dr. Elsherif commenced his power point presentation with a quote from Pennsylvania State University, USA to explain the importance of application to the effectiveness of herbicides:

“Spray application is perhaps the weakest link in the chain of events a pesticide follows through its development process. Some researchers claim that more than 70 percent of the effectiveness or success of pesticide use will depend on the effectiveness of the spray application”—Penn State University, U.S.A.

He said, "Effective application is important and entails using quantity of herbicide sufficient enough to reach the targeted crop and minimal enough to avoid environmental contamination. Thus application technique will have an influence on the efficacy of pesticides and on safety of man and the environment.

"The effective technique must be able to strike a balance between reducing drift /operator exposure; and achieving good penetration and distribution of herbicide on weeds. Striking this balance is the big challenge that must be overcome."

According to him, overcoming the challenge requires knowing the nature of herbicides, the methods and equipment of application (sprayers). It is therefore important to have understanding of the followings:

1. Herbicides can be foliar or soil type: The foliar herbicide needs to have adequate foliar coverage and plant tissue penetration while the soil type needs soil consistency and good tillage for good herbicide action.
2. Quality formulation is important in
 - a. allowing dilution of a small amount of active ingredient as recommended.
 - b. avoiding loss of active ingredient.
 - c. optimizing the coverage and penetration of plant leaves.
 - d. ensuring that the formulation will mix well in all weather conditions.
 - e. making measurement, handling and disposal easy.
 - f. conferring the ability to dissolve in water, fertilizers and liquid mixtures.
 - g. maintaining compatibility with other products.
3. Herbicides come in different formulations. Most common Herbicide formulations are Emulsifiable Concentrate (E.C), Suspension Concentrate (S.C.) and Water dispersible Granules or Wettable Granules (W.G.).
4. These different formulations behave differently and each one could be more suitable for a particular situation or condition.
5. However, the different formulations can be combined together. In combining or mixing different formulations, the required quantities of the chemicals should be added into the spray tank in the following order: W.G. followed by S.C. and E.C.
6. Application principles:
 - Generate the right spray droplets by choosing the right nozzle, and by applying the right pressure. High pressure produces small droplets and low volume while low pressure produces big droplets and high volume.
 - Ensure to apply herbicides at the right pressure.
 - Check spray pattern of nozzle. Check also for abrasion and wear of nozzles, and change if necessary.
 - Avoid drift by using anti drift nozzles.
 - Don't spray herbicides under high temperature and avoid spraying in the wind. Be mindful of wind speed and direction.
 - Do not spray in the rain or in hot sun.
 - Carry out a spot or trial spray on a small portion of land to check your preparation before spraying the whole farm.
 - Avoid barriers to absorption such as leaf surface run off due to high volume and crop forming canopy over weeds.



Dr Elsherif during a training session

Knapsack Calibration

Calibration refers to the determination of water volume required per area. It is necessary to calibrate the knapsack before spraying to ensure that the required dosage will be applied.

To calculate the exact spray volume per hectare it is necessary to know:

1. Walking speed (km/h): This affects the effectiveness of spray. High walking speed results in too low volume and low walking speed will give too high volume. Therefore the walking speed should be moderate.
2. Spray width (cm): This is determined by
 - Nozzle type
 - Spray angle
 - Height of nozzle from the ground

The nozzle should always be held at the same height during application. The spray width should be checked on a dry surface.

It is recommended that nozzles should not be lower than knee length to the ground.

3. Nozzle flow rate (l/min): The coverage of spray is affected by the type of nozzles used. So it is important to use the right nozzles during herbicide application. Do not use damaged nozzle.

Note: There are two ways of calibrating: The Distance area method and the sprayer volume refilling method. The sprayer volume refilling method is simple and practical enough to use particularly by the farmers. It involves filling your knapsack tank with water and spray over a determined area of the land taking note of your walking speed, time spent and the area covered. Fill back your tank; match the volume of the refill with the area covered. Extrapolate what you get to determine equivalent volume per hectare or acre. That way you can estimate how much volume of mixed chemical you need to apply to your field.



Participants in the field

Major Points to note in Herbicide Application

1. Fill and mix according to instruction / calculation / experiences.
2. Divide the field in 5 sub-plots.
3. Mark these sub-plots.
4. Look to wind direction and decide where to start.
5. Start spraying according to best practices.
6. Mark the end of each single sprayer.
7. Take notes after application for next season.
8. Calibration data for this field are valid for other applications.

Questions and Answers:

During questions and answers the followings were recommended:

- When weeds are high, slash or burn and allow fresh regrowth before using chemical.
- There should be proper timing of herbicide application.
- Integrated weed management should be considered and adopted as much as possible.
- Operator should not go to the field alone to spray chemical. He should always have somebody to assist him.

Session 2

“Safe Use of Pesticides for a Sustainable Environment” by Engr O.O.O. Sode of NESREA

Engineer Sode’s presentation started with the picture of how more toxic our environment has become because of the wide use of chemicals in general. He pointed out that agrochemicals, in particular, have been subjected to misuse with dangerous consequences on the environment. He noted that there are a number of international efforts to control the use of chemicals. There is need to keep harmonizing the efforts.

He expressed optimism that the collaboration between NESREA and IITA Cassava Weed Management Project would harmonize the efforts of the two organizations and help in checking the abuse of herbicides by farmers.

According to him, the Act which established NESREA mandates the organization to control pollution of the environment in general.

He summarized the role of NESREA as follows:

1. To educate, sensitize and enforce banned chemicals.
2. To regulate controlled chemicals. (the regulations are awaiting final gazetting).
3. To promote the adoption of alternative to chemical use and safety measures when chemicals are used.

To this extent, a number of measures are usually suggested. These include:

1. Adoption of Integrated Pest Management (IPM). This method relies less on use of chemicals.
2. Consulting and planning before applying chemicals.
3. Use of trained personnel to carry out chemical application.
4. Reading and understand chemical labels for level of toxicity, direction of use etc.
5. Being appropriately prepared to handle emergency.
6. Use of Personal Protective Equipment (PPE) during application of chemicals.
7. Being sensitive to vulnerability of neighbors and protected areas.
8. Training operators on safe handling and use of chemicals.
9. Carrying out soil tests before applying herbicides.
10. Disposing chemical containers properly.



Engr Sode

Session 3

“NAFDAC Regulatory Activities on Pesticides” by Dr. Idayat Mudashir of NAFDAC

Dr. Idayat Mudashir’s presentation gave the background that necessitated the establishment of NAFDAC and the concern about agrochemicals in particular. She said there was increasing reliance on agrochemicals with improper use causing accidents and pesticide residue in foods and livestock. “And since there is a maximum residue level (MRL) permitted in food, there is need to institute a control. The need for this control led to the establishment of NAFDAC,” she explained. According to her, NAFDAC was established by Decree 15 of 1993 as amended by Decree 19 of 1999, and now the National Agency for Food and Drug Administration and Control

Act Cap N1 Laws of the Federation of Nigeria, 2004 to protect end users from fraudulent claims about product performance and also most importantly protect human health and environment.

NAFDAC is empowered through her laws and regulations to determine the intended use, quality, efficacy and safety of pesticides.

These laws include:

- NAFDAC Act Cap N1 LFN 2004
- Counterfeit, Fake Drugs and Unwholesome Processed Food Act Cap C34 LFN 2004
- Import (Prohibition) Act Cap 13 LFN 2004
- Pesticides Registration Regulation 2005



Dr Mudashir

Regulatory Activities of NAFDAC

- Good Manufacturing Practice (GMP) inspection.
- Product registration / marketing authorization.
- Quality control.
- Issuance of Permit for bulk importation.
- Advert control and consumer complaint.
- Enforcement / Litigation.
- Pharmacovigilance and post marketing surveillance.
- Collaboration with research institutes to conduct field trial evaluation to ascertain the safety and efficacy of pesticides.
- Port inspectorate activities which inspect all regulated products and routine laboratory screening of every consignment of an already registered product imported into the country.
- Promotion of safe and responsible use of agrochemicals through workshops in collaboration with other relevant stakeholders.

She explained that NAFDAC had put up a number of measures to control the manufacture and importation of pesticides in Nigeria. Some of the relevant measures and requirements include the following:

Precautionary Measures

- Special precautions must be taken during transport, storage and handling.
- Spray equipment should be regularly cleaned and maintained to prevent leaks.
- People who work with pesticides should receive proper training in their safe use.
- Use suitable equipment for measuring pesticides.
- Appropriate personnel protective equipment should be worn in accordance to manufacturers' specifications.

Labeling Requirements

The following are the basic labelling requirements on a pesticide

- Trade name of the product.
- Name and quantity of active ingredient and net content.
- Purpose for which it is to be used.
- NAFDAC registration number.
- Name and address of the manufacturer.
- Date markings.
- Directions for use and storage.
- First-aid instructions and advice to health personnel.
- Hazard symbol.
- Safety precautions and warning.



Participants comparing notes

Session 4

“SON Regulatory/Standardization Perspectives Associated with Application & Safe Use of Pesticides” by Engr. Ololade Ayoola of SON

Mr Ayoola started the presentation by intimating participants with the legal provisions of Act. No.56 of 1971 which gave SON the mandate to perform activities, set, and enforce standards for product regulation in Nigeria.

He said, “SON performs the following activities related to weed management and pesticides in Nigeria:

1. Elaboration of Standards, Codes and Guidelines relevant to all sectors.
2. SON Conformity Assessment Program (SONCAP) for Imported Products (Safety Footwear, Overall coats, Sprayers, Tractors, Herbicides etc...)
3. Mandatory Conformity Assessment Program (MANCAP) for Products manufactured in Nigeria and Product Registration (Safety Foot wears, Safety goggles etc.).

4. Metrology: The Section undertakes scientific and industrial metrology and renders calibration services. It also ensures that equipment for the application of pesticides such as hand operated sprayer, motorized sprayer, boom sprayer, air-blast sprayers granular applicators, aerial applicators and other applicators; and safety and protective gadgets (coveralls, chemical resistant suits, gloves, footwear, aprons, headgear, protective eyewear and respirators) conform to set quality standards.



Engr Ayoola

Session 5

“Pesticide Tank Mix, Equipment Maintenance, and Safety Precautions in Handling” by Dr Mohamed Elsherif

In this session, Dr. Elsherif emphasized the need for equipment maintenance and safety precautions. He was very particular about the need to protect the hands and other parts of the body that are prone to exposure. He also paid attention to the need to keep equipment clean and well stored.

Below are the main points of his teaching:

Equipment Maintenance

1. Do not keep mixed solution for long in the knapsack without use. Prepare spray mixture enough for the work or the day.
2. When mixing different formulations add WG first and agitate, then add SC and EC accordingly.
3. Cleaning of sprayer is important. Clean properly and appropriately.
 - Clean daily after work.
 - Empty sprayer completely.
 - Ensure no residue is left at the bottom.
 - Flush sprayer 2 to 3 times with water.
 - Clean funnel and filter used while filling sprayer.
 - Clean nozzle properly for a good day's job.

Personnel Safety

1. Protect your skin.
2. Avoid inhalation or direct skin contact.
3. Wear hand gloves and nose/face mask.
4. Read and follow label instructions.
5. Chemicals are toxic. Always ensure low exposure to chemicals.
6. Hand exposure is critical. 80-95% of exposure is usually through the hand. Use hand gloves.
 - It is cheaper to pay for the gloves than to treat contaminated hands due to chemical exposure.
 - Use chemical resistant gloves.
 - Use gloves at all stages of chemical handling and do not use damaged gloves.
 - Clean and dry gloves before use.
 - Test the gloves for leakages.
 - Tuck the gloves over shirt sleeves.
7. Do not drink or smoke around chemicals.

Documentary Video

A short documentary video on handling techniques and safe use of chemical was shown to give a practical demonstration of some of the principles that have been taught in the course of the training.

Session 6

“How Herbicides Work” by Dr. Mohamed Elsherif

Dr. Elsherif explained that herbicides work by inhibiting the cells of weeds. “Selectivity principle helps herbicide to discriminate between crop and weed. The selectivity of a herbicide can be determined by the extent of crop injury resulting from its application. Crop injury is expressed physically as any of the followings: bleaching, chlorosis, necrosis, stunting and thinning,” he explained.

He said factors which accentuate crop injury include:

- Water management.
- Environmental factors (i.e. temperature, humidity).
- Land preparation.
- Cultivation/planting practices (eg shallow planting; root exposure).
- Variety response.
- Soil type / structure/ condition.

Herbicides also exhibit different levels of efficacy according to type of weeds (broadleaves, sedges and grasses). Other factors that will affect the efficacy of chemicals include leaf surface (whether waxy or hairy), crop canopy cover, size of droplets, weather condition at the time of spray, run off, choice of formulation, the quality of the chemical itself etc.

Evaluation of Selectivity and Efficacy

Three evaluations are usually done for selectivity and two evaluations for efficacy. These evaluations are used to rate the plots. Rating of plots is done either by counting or by visual assessment.

Getting Kitted for Safe Application

Participants were taken through a short demonstration of how to be properly kitted with Personal Protection Equipment (PPE) which are usually recommended for use in the application of chemicals. They were also shown the various types of nozzles and how to use them. The PPE (including coveralls, hand gloves, nose and face masks, boots etc) used were provided by Bayer Crop Science of Germany.



Participants fully kitted

Field Practical Session:

“Calibration of Knapsack Sprayer and Plot Rating” by Prof Friday Ekeleme and Dr Mohamed Elsherif

The participants were divided into five groups. Each group was kitted with Bayer protective kits and asked to calibrate a knapsack sprayer using the two methods of Distance Area and Sprayer Volume Refilling.

Thereafter the groups were asked to rate a plot for chemical efficacy and selectivity on an experimental plot planted with cassava.

Reports on the Calibration and Rating by Participants

Each group of participants presented its report of calibration and plot rating. Prof Ekeleme and Dr Elsherif took time to explain the implications of the results presented by the groups.



Participants presenting results

Presentation of Certificates

Prof. Ekeleme and Dr. Elsherif, on behalf of the Project Leader, presented certificates of participation to the participants including the representatives of the regulatory agencies.

Vote of Thanks

Mr. Godwin Atser, who facilitated the program thanked the resource persons, the participants, all members of the project team and IITA for their roles in the success of the training program.

Closing Remarks

Dr Alfred Dixon expressed satisfaction with the success of the program, saying that in spite of his exposure he had gained tremendously from the little he was able to receive from Dr Elsherif’s presentation. He said that the training was a good one for all participants as it would ultimately help to correct the many wrong ways in which herbicides were being handled and used.

He thanked Prof Ekeleme for his efforts in organizing the training. Thanks were also made to Bayer CropScience for their support.



L-R: Dr Elsherif, a participant, and Prof Ekeleme during certificate presentation

Feedback from Participants

Mr Kayode Murphy who spoke for the participants expressed appreciation for the invaluable knowledge the training had offered the participants. He was particularly happy that in spite of his own personal experience and exposure, there was still so much to learn from the training. He believes that many of his co-participants would have learnt much more.

For Bolatito Olabisi, "Now I can spray comfortably while avoiding over dosing and under dosing. The knowledge gained can also help me to reduce health risks



Murphy

when handling pesticides. I can also spray to reach my target. I have acquired calibration, kitting and rating skills. I can now calibrate a sprayer, kit myself for safety, and rate a farm plot. I will go back and put this knowledge into practice on my field. I will teach and encourage other farmers around me to do same.

Rufai Sunkanmi, another participant said, "The training was educative and innovative. The trainers are vast and professional in delivering the lectures, making the topic simple. The training should be sustained."



L-R: Dr Okunlola O (SON), and Godwin Atser (Communication & Knowledge Expert)



A participant

Saka Afeez Opeyemi said, "Yes the training has improved me theoretically and practically. It has opened my eyes to a new skill in spraying. The training was okay, very informative and it came at the time I needed it since I am personally in the field. Thanks to Bayer CropScience, Prof. Ekeleme, and IITA in general."

And Ugbaje Vivien said, "Yes, I have now known the importance of PPE, how to calibrate my own spraying volume and how to rate crop injury and efficacy. The training was very much okay. I will teach the local farmers in my community. I will even use it to teach other students. Bayer CropScience and IITA Cassava Weed Management Project should sustain this training."



Seun Ogidan (IITA Youth Agripreneur)



Olabisi

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Date: 27-28 April 2015

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2-Days Training Workshop on Application Techniques and safe use of Pesticides
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DAY 1: 27 April 2015

08.00 – 08.30	Arrival & Registration of Participants	Mrs. Eroh and Deji
08.30 – 09.00	Welcome Remarks	Alfred Dixon
	Self-Introduction of participants	
	Introduction of Course Objective Introduction of Resource Person	Friday Ekeleme
09.00 – 09.10	Levelling of Expectations	Ezinne Ibe
09.10 – 10.10	<ul style="list-style-type: none"> Equipment calibration [Knapsack, Mist blower] - Theory Herbicide calculation Herbicide application on small and large plots 	Mohamed Elsherif
10.10 – 10.30	Group Photo & Tea/coffee Break	
10.30 – 11.00	Questions & Answers Session	
	Regulatory issues	
11.00 – 11.20	Presentation by NAFDAC	
11.20 – 11.40	Presentation by NESREA	Peter Ogar
11.40 – 12.00	Presentation by SON	Margret Eshiett
12.00 – 13.00	Question & Answers on Regulatory issues	
13.00 – 14.00	Lunch Break	
14.00 – 15.20	<ul style="list-style-type: none"> Safety precautions in handling, mixing, storage, transportation, disposal of used containers, managing spills Equipment maintenance 	Mohamed Elsherif
15.20 – 15.40	Tea/coffee Break	
15.40 – 16.10	Question & Answers	
16.10 – 16.30	Administer Feedback Forms to Participants	
16.30 – 16.40	Recap of Day 1 Activities	
16.40 – 17.00	Closing of Day 1 activities	

DAY 2: 28 April 2015

08.30 – 08.40	Evaluation of Day 1 activities	
08.40 – 09.00	Briefing on Practical Exercises/Field Demonstrations	
09.00 – 13.00	<ul style="list-style-type: none"> Equipment calibration [Knapsack, Mist blower] -Practicals Weed control rating of individual and total weed spectrum – Field demonstration Crop injury rating – Field demonstration 	Mohamed Elsherif
13.00 – 14.00	Lunch Break	
14.00 – 15.30	Question & Answers on Practical Exercises/Field Demonstrations	
15.30 – 15.50	Administer Feedback forms to participants	
15.50 – 16.30	Closing remarks	Alfred Dixon
16.30 – 17.00	Conclusions and formal closing	Friday Ekeleme
	Departure	



