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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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TRAINING CENTRE FOR FORMULATION AND BIOLOGICAL SCREENING OF PESTICIDES SPONSORED BY UNIDO

by

I. Marinescu
UNIDO/Romania Joint Centre
Bucharest, Romania

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C O N T E N T S

At the UNIDO's meeting held in Bucharest between the 10th and the 14th of July 1972, the Romanian delegation proposed the setting up of a Centre for formulation and [illegible] the auspices of UNIDO; this centre should provide the training and specialization of personnel coming from member countries.

In the conclusions and recommendations of the meeting (point 13, C) this proposal was formulated as follows: "It is recommended that UNIDO should investigate the possibility of setting up a research and development centre to serve member countries in the solution of their research, manufacturing and training problems in pesticide formulation and application".

1. Main objectives and implementation of the Centre

The training centre for pesticide formulation and testing is supposed to have a complex structure; the participants attending the training programmes will receive a diversified programme covering the formulation and the efficient, correct and safe application of pesticides, according to the most up-to-date methods.

The centre should benefit by the assistance of specialists from different countries with experience in the formulation, testing and application of pesticides. It should have sectors with modern equipment for formulation, physico-chemical analyses, biological screening, toxicology, documentation and theoretical training; all these facilities will be necessary to carry out research works and to specialize graduate personnel from the member countries.

The training programme will cover the following subjects:

A. Formulation:

- importance of pesticide formulation in assuring the optimum biological effect;
- development of the most efficient formulations;
- knowledge and selection of the most appropriate types of formulation;
- [illegible] ting in various countries;
- solving specific problems related to the formulation and application of pesticides which exist in different countries.

B. Biological screening

- biological screening of [illegible] types of formulation in laboratory, green-house and in the field;
- efficient and correct application of [illegible] on plants and crops;
- knowledge of modern and most efficient means of applying posticides on crops;
- residue and toxicology studies closely related to the correct application of pesticides, a.s.o.

In brief, the final goal pursued is that the trained personnel should [illegible] contribute in the setting up and development of formulation plants for production in their countries, units where the most adequate formulation forms should be elaborated and the application of these products should be as efficient and as safe as possible for the benefit of their respective country.

2. Organization structure of the Centre

The following structure is suggested for the centre:

2.1. Pesticide formulation sector:

2.1.1. Pesticide formulation laboratory;

2.1.2. Pesticide formulation pilot plant;

2.2. Biological screening sector:

2.2.1. Laboratories for the biological screening

of pesticide formulations and for the research work of side effects of pesticides (phyto-toxicity, toxicity for bees and other useful insects, products influence on the soil microflora, a.s.o.).

2.2.2. Toxicology, residues and metabolic products study laboratories.

2.2.3. Greenhouse where the main factors (temperature, humidity, aeration) can be adjusted;

2.2.4. Insectarium and rodents stockfarm;

2.2.5. Experimental field comprising cereals and technical crops, vegetables, fruit trees, vineyards and other crops.

2.3. Physico-chemical analyses laboratory for raw materials (active and inactive ingredients), formulated products, residues, a.s.o.

2.4. Study and documentary sector:

2.4.1. Lecture rooms;

2.4.2. Meeting hall (for symposia, expert group meetings, scientific meetings, projections);

2.4.3. Library and reading room comprising books and periodical publications especially on the production, formulation, screening and application of pesticides.

3. Scope, equipment and operation of the proposed Centre

3.1. Pesticide formulation sector

It is assigned for the elaboration of different types of formulation. Within this sector the participants attending the training programmes could come and solve a series of specific problems for their countries (specific compositions of formulation, own inactive ingredients a.s.o.).

3.1.1. Pesticide formulation laboratory. It will be designated for laboratory work in view of elaborating various formulation compositions.

- emulsifiable concentrates;
- oil concentrates;
- aqueous concentrates;
- oil solutions;
- LV and ULV solutions;
- dusting powders;
- wettable powders;
- seed designs;
- dust concentrates;
- granules;
- pellets;
- aerosols;
- poison baits;
- capsulated formulations;
- pesticide fertilizer mixtures.

In the same laboratory could be carried out:

- compatibility determinations of inactive and active ingredients;
- stability in time of formulations;
- stability determinations of emulsions;
- storage stability of formulated products under different weather conditions;
- wettability, sorptivity, abrasion a.s.o. determinations;
- determination of granulometric curves, surface tensions and [illegible] a.s.o.
- compatibility studies among pesticides.

This laboratory will be accordingly equipped with formulation apparatus on a lab scale:

- various types of mills (colloidal, ball, attrition, hammer, cage mills etc.);
- mixers, ribbon blenders, tumblers;
- micronizers;
- granulators;
- common lab equip[illegible] for the formulation laboratories (e.g. [illegible] ces, determination apparatus for [illegible]

face tension, a.s.o.).

Chemists specialized in formulation will work and carry out demonstrative formulations in this laboratory.

3.1.2. Pesticide formulation pilot plant

This sector is assigned to get the participants familiar with formulation units, with apparatus, manner of operating and characteristic technologies of pesticide formulation.

This sector will comprise equipment for liquid and dry formulation (mentioned above) and the capacity of the formulation units (wettable powders, dusting powders, granules, emulsifiable concentrates a.s.o.) will meet the level of a pilot plant. (For instance, formulation vessels with stirring for emulsifiable concentrates or solutions - capacity 750-1000 l, atomizers of 0.5 - 1 t/d powder).

3.2. Biological screening sector

In this sector the trainees attending the training programs shall be initiated and trained to determine the biological efficiency of the formulated product in order to control deseases and other plant pests, to know the secondary effects of a correct or wrong application of pesticides, the acute and chronic toxicity of pesticides, of residues and metabolic products towards mammals.

3.2.1. Laboratories for biological screening of formulated pesticides. In these laboratories the participants should study the biological activity of insecticides, fungicides, herbicides, rodenticides and their collateral effects. The trainees should also study:

- manner of procuring the biological material (micro-organisms separation from vegetative tissues and soil and their growing on various culture media, breeding of insects and rodents designated for experiments a.s.o.);

- the mostly used methods of screening the various types of pesticides;

- practical experiments implementation by using one or more of the methods in order to establish the toxicity of the products, speed of action, action spectrum, manner of action;

- pesticide secondary effects, toxicity towards useful entomo-fauna, including bees, influence upon the micro-organisms in the soil a.s.o.

The laboratories should be provided with specific equipment for pesticide screening:

- autoclaves;
- microscopes and binoculars;
- thermostates, analytical balances a.s.o.;
- hand spraying and dusting equipment (that should be used in the greenhouses).

The personnel working in these laboratories should be specialists in plant protection, entomologists, phytopathologists, biologists, biochemists a.s.o.

3.2.2. Toxicology, residues and metabolic products study laboratories. In these laboratories research works will be carried and the trainees will be initiated in the toxicology of pesticide products and in the manner of studying the residues and the metabolic products:

- the influence of the various pesticide products on animals (fish, birds, mammalia);
- penetration ways, affected organs, chronic and acute toxicity;
- metabolic products, their toxicity, their way of elimination or accumulation in the organism;
- symptoms and signs of poisoning;
- remanence of persistent pesticide products in the plants and in the soil;
- results of residues accumulation;
- factors influencing the pesticide persistence (pedoclimatic factors,,pesticide type, formulation types, soil microflora a.s.o.).

The phases and methods of determining the pesticide residues and metabolic products (sampling, extraction, separation, individual determination or in admixture with other compounds, identification and quantitative determination) could also be followed up.

These laboratories should be equipped according to their specific character and be provided with analytic equipment (chromatographs, IR, UV, mass and NMR spectrophotometers, polarographs. calorimeters a.s.o.).

3.2.3. Greenhouse where the main factors (temperature, humidity, ventilation) can be adjusted. In the greenhouse the formulated pesticide products will be tested, The trainees will be aware of the manner in which the biological experiments, treatment methods and data interpretation of pesticide phytotoxicity and efficiency on this scale a.s.o. are carried out.

3.2.4. Insectarium and rodents stockfarm. Rooms for growing insects, necessary for experiments on lab scale and greenhouse for growing rodents and other animals should be provided.

3.2.5. Experimental field. It should include cultures of cereals and technical plants, vegetables, fruit trees and vineyards. The cultures from the experimental field should serve to study and to make demonstrative trials of pesticide application and field testing.

This experimental field, divided into plots with plantations and adequate irrigation, should be provided with equipment to spread various types of formulation.

The trainees could follow the most suitable application equipment, the most appropriate, correct and economical methods and rates of application.

This experimental field will be staffed with specialists in pesticide application and plant protection.

3.3. Physico-chemical analyses laboratory.

It should help the trainees to know the most modern

and efficient physico-chemical analyses, equipment and methods for raw materials (pesticides, solvents, wetting agents, emulsifying agents, dispersing agents, mineral carriers, granules), formulated products (for determining the content of the active ingredient, after formulation, stability trials a.s.o.).

The laboratory should be provided with common equipment specific to an organic and inorganic chemical analyses laboratory as well as with:

- GLC chromatographs, with interchangeable detectors (microcoulometric, electron capture, thermistors, flame photometric, electrolytic conductivity, sodium thermionic etc.);
- IR, spectrophotometers;
- spectrophotometers for visible and ultraviolet;
- RMN and mass spectrometers;
- equipment for thin layer chromatography;
- multi-purpose automatic titrators;
- oxigen combustion apparatus Schöniger and Dumas type;
- extraction apparatus;
- Boetius type apparatus for wetting point;
- viscosimeters.

Analysts and specialists in analytic equipment should work in this laboratory; a specialist in lab equipment maintenance should also work here.

3.4. Study and documentation sector

It will serve for the preparatory programme, The training programmes are suggested to be organised for series of 30-40 persons for a period of about 3 months.

The trainees should be graduates and according to the importance of the problems they have in their countries they could be chemical engineers, chemists, analysts, agronomists, biologists and others.

It is suggested that the training programme should be implemented into two groups:

- training group for posticide formulation;
- training group for posticide application and biological screening.

It is also suggested that the Centre should organize meetings, lectures for specialists, scientific sessions at which well known specialists in production, formulation, application and biological screening of pesticides should lecture.

3.4.1. Lecture rooms and practical work. The theoretical lectures will be held in the lecture rooms and the laboratories will serve for formulation practical works and for experiments with a didactic character.

3.4.2. Conference facilities.

An amphitheatre having about 300 seats will be designated for the above mentioned international conferences and meetings, film and slide projection.

3.4.3. Library and reading room. It will comprise books and specialised periodical publications related to pesticide chemistry, technology, application, toxicology, as well as the means of material reproduction.

4. Some organization problems

In the Socialist Republic of Romania a series of conditions necessary for an optimum functioning and implementation of such a centre exists:

- a chemical industry (including pesticides) in an impetuous development and diversification;
- chemical and agricultural research centres that can offer their collaboration and experience on pesticide formulation, screening and application;
- diversity of cultures and pedoclimatic conditions that confer various conditions of biological screening of different types of formulation;
- advantageous geographical position from the transport and communication standpoint.

The results and experience obtained by the setting up and functioning of this centre could serve as an example for the establishment of similar training centres under the care of UNIDO in other areas of the world.

4.1. The training Centre should be under the aegis of UNIDO and it is suggested to be situated 50-60 kms far from Bucharest, as the city has numerous research centres.

4.2. The training programme shall include study tours to pesticide producing and formulation factories, to research centres for plant protection and to agricultural farms having experimental fields for plant protection.

4.3. With regard to the setting up, construction, equipment supply for the centre, it is suggested to be carried out into stages.

4.4. We consider that the next stage should consist in the elaboration of a feasibility study comprising proposals of a functional and financial statute. Specialists appointed by UNIDO togehter with Romanian specialists should perform this study until the end of 1973.

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