REPUBLIC OF KENYA

PEST CONTOL PRODUCTS BOARD (PCPB)
P.O. Box 13794-00800, NAIROBI.

PROTOCOL FOR EVALUATING THE EFFICACY FOR PEST CONTROL PRODUCTS IN KENYA.

Title of trial……..

Principal investigator: ……

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…….

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Permit Ref……

1. Introduction

Efficacy evaluation of a pest control product is important because it enables the registration authorities to evaluate the benefits to be gained from new products and to weigh those **benefits** against potential **hazards** due to their introduction.

In the past, reports of efficacy trials have not been uniform, making the evaluation for registration of pest control products difficult. To ease this problem PCPB has decided to provide guidelines to scientists carrying out the efficacy trials with a view to harmonising the reporting system that will improve the evaluation process for the registration of new pest control products. A number of issues are highlighted in this protocol and the researchers should take them into account while carrying out the efficacy trials.

All trials must be authorized by the Board. It is recommended that the Board, the trial scientist/institution and the applicant liaise closely throughout the trial period.

2. Objectives

State clearly the pest control product being evaluated, target pest(s) and other objectives.

3.0. Materials and Methods

Guidelines on plot size and method of evaluation will depend on the specific pest/crop combination and the agricultural practice concerned. However they must be internationally or nationally acceptable.

Trials are, in principle, carried out in the field, but if the test product is to be used on laboratory/glass house crop, the trials will be carried out under laboratory/glasshouse conditions close to those of practical use.

3.1. Trial site selection

The sites should be as level and uniform as possible and representative of the conditions where commercial use is anticipated. Sites with irregular soil conditions should be avoided.

The disease/pest which forms the object of the efficacy trial should occur in a uniform pattern over the site or should be expected to become uniformly present during the trial period. Before trials are carried out, it is important to assess the infestation levels.

When selecting a site, the history of the site should be considered e.g. the preceding crop situation, previous infestations, etc. A single preceding crop, on which only uniform treatments were applied, should have been grown over the whole area of the site.

As a general rule, sites at field edges, or near ditches, trees, hedges or other obstacles should be avoided, as they are subject to interfering “edge” effects from those obstacles.

It is usually desirable to site the experiment towards the center of a normal commercial crop. If this crop has to be treated with a pest control product which may interfere with those under study in the experiment, then a sufficient margin of untreated crop should be left in the immediate vicinity of the experiment. If the trial consists of repeated blocks which follow each other in the direction of drilling, spraying or other treatments of the crop, it may be helpful to have a gap between the blocks to allow for turning the supply of the pest control product on and off, and for aligning the apparatus with the next plot or sub-plot.

3.2. Trials on glasshouse crops

In the glass house, the same general principles apply. If products with high vapour pressure, fumigants, aerosols or fogs are tested, separate glasshouses or glasshouse compartments should be used for each treatment.

3.3. Trial lay-out

The design of a trial intended for efficacy evaluation should permit a statistical evaluation. It should however be simple but compatible with the immediate objective of the test. Multi-factorial designs should be avoided.

A randomized complete block design is usually adequate. Each block should comprise the following:

(a) The pest control product(s) to be evaluated.
(b) The reference registered(standard) product(s).
(c) The control (a non-treated plot).

These should be distributed at random, the blocks being repeated as many times as there are replications.

If it is necessary to introduce into the experiment other factors in addition to the treatments of the pesticide(s) under study at the recommended dosage rate (e.g. various times of application for other dosage rates) this can be accomplished by splitting the main plots into sub-plots, provided that the size of the sub-plots is still sufficient to allow a reliable evaluation.

3.4. The non-treated control plot

It is important to note that in some situations, the layout of non-treated plots within the randomized blocks may give rise to disadvantages due to extensive interference between non-treated and treated plots. Examples are efficacy trials for fungicides with “preventive” action on susceptible cultivars of potatoes, or apples for the control of late blight and apple scab, respectively. In order to avoid heavy losses in crop growth on the trial plots or in the following year’s crop, it may sometimes be necessary to discard the non-treated plots from the experiment shortly after the occurrence of the disease becomes obvious. The initial non-treated plots should be sprayed, taking due care to avoid drift into treated plots.

3.5. Choice of reference product

The reference product is sometimes referred to as a **standard** or positive control. Wherever feasible the reference product chosen should be **registered** in Kenya and should have shown satisfactory results in practice. It should have the same, or similar, mode of action as that of the test product e.g. if the test product is pre-emergence herbicide, then the standard reference should be a pre-emergence herbicide.

3.6. Plot size and shape

This should be determined by the crop-pathogen combination in question. In tree crop trials, it is desirable to have 4-6 trees per net plot to allow for

variability between trees. In agricultural crops the minimum plot size should be between 9m^2 (e.g.1.5x6m for cereals) and 100m^2 (e.g. 10 x 10m). The minimum plot size in very uniform vegetable or flower crops may be smaller, if internal interferences can be avoided.

Factors that may influence plot size include lateral spread of treatments, the available equipment for spraying or other mode of treatment, and harvesting method. The plot size should be sufficiently large to allow for periodic sampling and evaluation of the crop yield at harvest.

3.7. Number of replications

This will be determined by the likely magnitude of experimental variance and the number of treatments. The fewer the treatments, the more the replications needed to give an acceptable estimate of variance.

Four to five replications are usually sufficient to give a reasonable estimate of the variation, but in special circumstances three(3) may be acceptable (e.g. in glasshouse trials where separate glasshouses or compartments need to be used). In such a case, replications may be reduced to three or be replaced by replications in time. On the other hand, a greater number of replications will be required when there is an erratic distribution of disease over the experimental area.

When crop yield is not being evaluated, replications should be sufficient in number and the plot size large enough to offset the variability in crop yield due to variation of soil or other environmental factors over the test area.

3.8. Application of the pesticides

The type of equipment used should be stated. It should, as much as possible, be similar to that currently used in practice, and should give an even distribution of the pest control product over the plot. When relevant, information should be provided on operating conditions (e.g type of nozzles, operating pressure in Kpa).

The type, time and dosage of the pesticide application will be as proposed by the applicant. Precautions should be taken to ensure minimum interference with the adjacent plots (avoid drift).

3.9. Meteorological data

Around the time of application, precipitation (type and daily amount in mm), temperature (daily average, maximum and minimum in ^{o}C) should be recorded on the field trial site or obtained from a nearby meteorological station. Extreme weather conditions such as severe and prolonged drought, storms, hail, etc, which are likely to influence the effect of the product(s) should also be recorded. For glasshouse trials, temperature and humidity should be recorded throughout the trial period.

3.10. Assessment of efficacy

Assessment of parameters should be scored using internationally acceptable methods. For weeds and many diseases, guidelines already exist specifying the type and time of assessments, the minimum sample sizes, sampling and scoring systems. All aspects of methodology used should be clearly stated.

3.11. Phytotoxicity and other side effects.

The type and extent of phytotoxicity should be described and, where appropriate, recorded according to a recognized scale. Any detrimental effects on wildlife and/or beneficial organisms should also be recorded.

3.12. Residual effects

The effect of the pesticide on subsequent crop should be stated.

3.13. Statistical analysis of data

The statistical method(s) used should be indicated. The raw and statistically analyzed data should be held by the experimenter for submission on request. All data and information should be filed appropriately for easy retrieval.

4. Results

The results should be fully described in relation to the stated objective. Tables should contain summaries of statistically analysed results showing: levels of significance, Coefficient of Variation (CVs), Least Significant Difference(LSD), mean separation etc. The data should include summaries of results obtained from previous seasons.

5. Discussion

- State main findings
- How the findings relate to stated objectives
- Any inferences made
- Explain any variations or factors that may have influenced the performance of the product under investigation

6. Recommendations

- State clearly whether the product should be registered for the stated use based on your findings.
- The researcher should clearly recommend:-
  . application rates
  . time of application
  . frequency of application
  . spray volume
  . harvest interval etc.
- State clearly whether the data met the 3 consecutive season criteria.

The following is a guideline for efficacy evaluation for a pest control product in Kenya.

(a) **Introduction**	**Remarks**
1. Name of experimenter and organization responsible.	Name of principal investigator and institution
2. Common Name of the active ingredient and tested formulation, Name, type.	Provide name, type and concentration of the formulation.
3. Source of the formulation tested.	Manufacturer/Registrant/Agent/Distributor etc.
4. Information on Reference product.	Use a locally registered reference product with comparable mode of activity.
5. Pest(s) against which tested.	Identify/Specify by using scientific name.
(b) Objectives	
1. Objective and location of the trial.	State clearly the objective of the efficacy trials and location to include the candidate pesticide, target pests or crop.
(c) Materials and methods.	**Should include:-**
1. Crops, Cultivars	Highly susceptible commercially available cultivars should be used in case of fungicides.
2. Plant growth stage (pest or crop) at application time.	Use internationally accepted classification systems.
3. Period of testing.	Specify dates.
4. Soil type, conditions.	Soil texture, moisture, surface condition, system classification should be specified.
5. Experimental design, size, number of plots treated.	Describe in detail.
6. Control and untreated areas.	Necessary
7. Application rates, dilution, spray volume.	Information to be provided.
8. Number, timing, methods of application and equipment.	Describe in detail.
9. Weather conditions during and after treatment.	Describe.
10. Treatment of the pests with other crop protection materials and other products.	Normal husbandly e.g. fertilizer, fungicide used, cropping method.
11. Evidence of performance of a local reference standard pest control product which has been included in the trials alongside the product under test.	Use locally registered reference standard.
12. Application dates	Mention in report.
13. Dates of assessment.	Mention in report.
14. Size and frequency of sampling	These should be indicated.
15. Assessment of parameters	Use internationally accepted scales.
(d) Results	**Remarks**
1. The effects on quality and quantity of the yield of the treated crops.	May be required.
2. Undesirable or unintended side effects (Phytotoxicity).	Explain in detail.
3. Detrimental effects on beneficial organisms etc.(specify).	Must be noted.
4. Statistical analysis of the data.	Use appropriate internationally acceptable statistical package e.g. Mstat C, SAS etc.
(e) Discussion	State main findings.
(f) Recommendation	The final recommendations should be clearly indicated.

NOTE:

1) For testing of the efficacy of pest control products in coffee, protocols approved for use at Coffee Research Foundation (CRF) will be applied.
2) For testing of efficacy of pest control products in migratory pests, protocols approved for use at Desert Locust Control Organization (DLCO) will be applied.
3) For testing of efficacy of pest control products in tea, protocols approved for use at Tea Research Foundation (TRF) will be applied.
4) For sugarcane, protocols at Kenya Sugar Research Foundation (KESREF) will apply.
5) For acaricide evaluations, protocols approved by the Department of Veterinary Services will apply.