

**Report**  
**Evaluation of the biological effectiveness of SWORD specialties**  
**on insects in a real and confined environment**  
**COMMERCIAL PROMOTION**

**NATURE OF TEST: Initial**

**Investigators :**

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- Mr Hassane SIDIBE , Ingénieur Economiste/ SANIYA -Mali (Initiateur)
- Dr. Coulibaly Aly :Entomologist (Genomics and Proteomics Laboratory University of Mali)
- Dr Moussa KEITA : National Project Fight Against MALARIA

**2- ABBREVIATIONS**

**FSOM:** Faculty of Medicine and Odonto-Stomatology

**KDT50:** The time at which 50% of the insects are knocked or dropped

**KDT95:** The time at which 95% of the insects are knocked or dropped

**Min:** minute

**MRTC:** Malaria Research & Training Center

**Spp:** species

**USTTB:** University of Science, Techniques and Technologies Bamako

**WHO:** World Health Organization / World Health Organization

**3- Introduction**

The Entomology Department MRTC (Malaria Research & Training Center) of the FSOM (Faculty of Medicine and Odonto-Stomatology of USTTB (University of Science, Techniques and Technologies of Bamako) was an invaluable support. We graciously received the University's facilities: the test cages. This work, which is within the scope of the trade promotion process and respect also the process established by the Sahelian Pesticides Committee (CSP).

The present work was to test the biological efficacy of the three SWORD insecticides.

**4-OBJECTIVES**

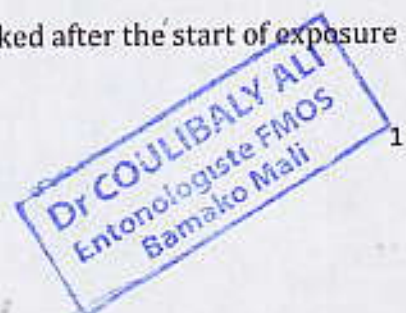
**General objective**

- To evaluate the biological effectiveness in real and confined area of the 3 SWORD products (Aerosol, Liquid and Spirals) on insects: mosquitoes, flies and cockroaches essentially

**Specific objectives for Sword Aerosol**

- To determine the time at which 50% of the insects are knocked after the start of exposure to the aerosol Sword

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## 5. Methods

### Place of study

The study was conducted from December 28, 2014 to January 4, 2015 in the neighborhoods of Kati, Kalaban , Faladié in Bamako and in the towns of Segou and Sikasso accordance with the protocol approved by Mr Krishna KUMAR TIWARI and with the help( not official) of Entomology department of MRTC, Faculty of Medicine , University of Science, Techniques and Technologies in Bamako, Mali. The work was done by twenty students of the Faculty of Medicine of the University of Mali.

### Mosquitoes

Collected mosquitoes females and provided for free by the MRTC.

Two mosquito species were tested: Anopheles gambiae, the major vector of malaria in Mali and Culex spp which is the main nuisance mosquito.

Cockroaches were tested with the aerosol and the result is satisfactory (see conclusion and table).

Each species of mosquito, flie and cockroach were randomly assigned and tested in cages and in homes selected in Bamako, Segou and Sikasso.

### Products

The products have been provided by the company: IMPACT HEALTHCARE - India, represented by Mr Krishna KUMAR TIWARI (Tel: +229 64 69 33 33 E.mail: [kt@impactcare.co.in](mailto:kt@impactcare.co.in)).

All three products are designed to kill insects in the home. They are described according to the manufacturer's technical notice.

### The study was conducted in two phases:

I- Efficiency study In a real environment

II- Aerosol efficacy study in a contained environment of FSOM Bamako

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## I - BIOLOGICAL EFFECTIVENESS STUDY REAL ENVIRONMENT:3 FORMULATIONS

### 1- BIOLOGICAL EFFECTIVENESS IN REAL ENVIRONMENT: Aerosol

The study was conducted by twenty final-year medical students in the popular districts of Kati, Kalaban, Faladié and cities of Segou at the center and Sikasso in southern of Mali.

#### Choice of rooms:

Each room measuring at least 12m<sup>2</sup> ( 4m x 3m) cement bricks , equipped with protective wire net and curtains. The protective wire net and curtains are open throughout the day and closed at 19 hours to allow maximum penetration of mosquitoes. Windows are closed and spraying takes place in the 20 hours. The control takes place 1 hour after. One hour after spraying aerosol, there is no mosquito in the room. This observation was made during the 2 days of spraying.

#### Conclusion:

The same observation was made in all families and reported by the students in charge of the operation.

It was revealed cases of presence of few mosquitoes (2 -3) in the morning in 13 families at Kati, Kalaban and Sikasso.

The tests showed that the product has a proved biological effectiveness in real environment.

This confirms the results of test efficiency in contained

### 2- BIOLOGICAL EFFECTIVENESS: SPIRAL

The same procedure was used for the same rooms. The spirals were turned on at 19H30 and it was asked residents to see the KO effect and mosquito repellent against the smoke.

**Smoke:** less aggressive and less pungent than other coils produced and sold locally.

**Aroma:** pleasant and persistent.

**Effect:** The repellent effect is better and occupants of treated rooms sleep all night.

**Conclusion:** SWORD spirals are quality and efficiency above + 95% local products.

### 3- BIOLOGICAL EFFECTIVENESS: Electric Diffuser

The time of two nights is not enough to properly assess the biological effectiveness of SWORD Electric Diffuser. However, we have received favorable opinions of the families who have seen a gradual reduction of mosquitoes during the night for both nights.

We have placed some samples in offices and will have results by the end of the second week of January 2015.

## I- BIOLOGICAL EFFICIENCY : AEROSOL SWORD

Special emphasis was put on the aerosol SWORD by MRCT because aerosol is representative of other Sword formulations. This study could have a formal status if we can involve the National Program against Malaria (NPAM).

Dr. Coulibaly has been very generous in offering us its equipments and facilities. He did it out of friendship for SANIYA Mali.

### Evaluation of the biological efficacy

#### Toxicity of the cages

Before starting the actual product tests we conducted cages toxicity tests on the recommendation of MRTC. These tests consisted of introducing 50 mosquitoes in each of five cages without insecticide and observe them for 12 hours.

#### Real evaluation

The cages were used only for aerosol tests on mosquitoes, flies and cockroaches. For each formulation the test was carried out in the home according to the WHO recommendations (WHO 2009).



Figure 1: Example of experimental cage (in glass and wood) for Aerosol SWORD.

The immediate mortality rate was also recorded. The insects were considered dead when they could no longer stand on the legs and could not move or fly. Householders confirm that all the mosquitoes are dead or knocked out after 60 minutes.

All 50 mosquitoes in each cage are dead after 3 minutes.

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## RESULTS:

### Cages toxicity tests

All 100 mosquitoes survived for 12 hours in the cages. This allowed to continue with the experiments whose results follow.

### Determination of KDT50, the KDT95 and mortality rates after aerosol exposure:

#### 1°) *Anopheles gambiae*

It was found that 100% of the mosquitoes are fallen in one minute after spraying Aerosol SWORD. Thus KDT50 as well as KDT95 is less than 1min. After five (5) minutes of exposure, 100% of the individuals were dead. Nevertheless, the observations continued until the end of 60 minutes. Individuals were removed after from test cages and observed after 24 hours, 100% died.



Fig 2: Mosquitoes dead in 5 min exposure using Aerosol SWORD

### Time of Knockdown and mortality *An. Gambiae*, the major malaria vector after exposure to the aerosol SWORD

#### Number of individuals exposed

CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50

#### Number of individuals fell in one minute

CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50

#### Number of individuals ded in one minute

CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50



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## 2) species *Culex spp*

It was found that 100% of the mosquitoes are fallen in one minute after spraying Aerosol SWORD. Thus KDT50 as well as KDT95 is less than 1min. After six (6) minutes of exposure, 100% of the mosquitoes were dead. Nevertheless, the observations continued until the end of 60 minutes. Individuals were removed from the cages and observed after 24 hours, 100% died

**Table 2:**

### **Time of Knockdown and mortality *Culex spp*,**

a very common mosquito in the cities and countryside, after exposure to the aerosol SWORD

Number of individuals exposed				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50

Number of individuals fellen in one minute				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50

Number of individuals ded in one minute				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50



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**Determination of KDT50, the KDT95 and mortality rates for flies after exposure to the aerosol SWORD**

3) Flies

This Table 3 shows that 100% of the flies fell down a minute after spraying. Thus KDT50 as well as KDT95 is less than 1min. After two (2) minutes exposure ,100% of the individuals were dead. Nevertheless, the observations continued until the end of 60 minutes. Individuals were removed from the cages and observed after 24 hours, 100% died (Fig 3).

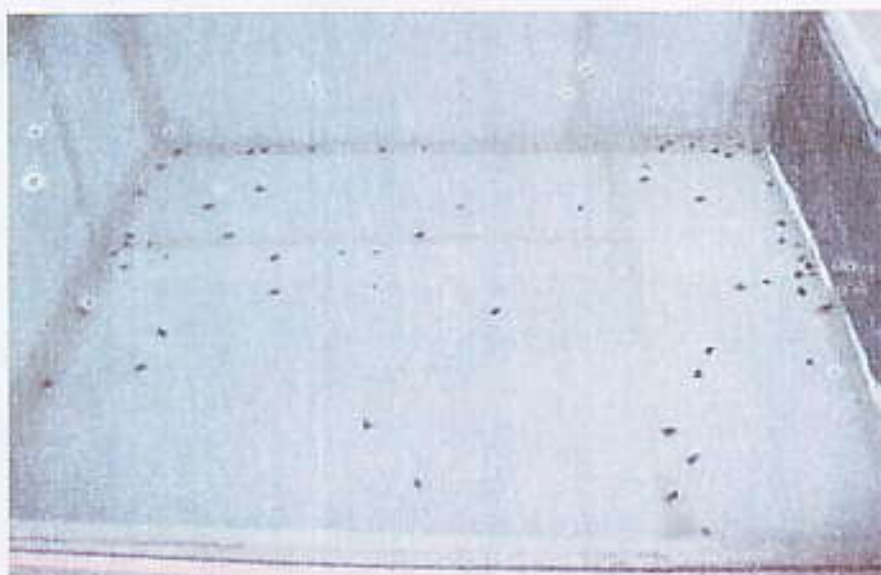


Fig 3 Dead Flies before 60 min exposures of products

**Table 3** : Time of knockdown and mortality flies after exposure to the aerosol SWORD

Number of individuals exposed				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50
Number of individuals fell per minute				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50
Number of individuals died per minute				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
50	50	50	50	50

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**Determination of KDT50, the KDT95 and mortality rates for cockroaches after exposure to the aerosol SWORD**

4) Cockroaches

Table 4 shows that the KDT50 and KDT95 are less than or equal to five minutes for aerosol Sword. After twenty (20) minutes of exposure , 100% of the individuals were dead. Nevertheless, the observations continued until the end of 60 minutes. Individuals were removed from the cages and observed 24 hours after, 100% were dead (Fig 4).



Table4

Table 4 Time of knockdown and mortality cockroaches after exposure to the aerosol SWORD

Number of individuals exposed				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
20	20	20	20	20
Number of individuals fell after 2 minutes				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
20	20	20	20	20
Number of individuals died after 5 minutes				
CAGE 1	CAGE2	CAGE3	CAGE4	CAGE5
20	20	20	20	20

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## 5. CONCLUSIONS

### **SWORD aerosol**

Product SWORD Aerosol showed a withering effect on insects exposed. This is supported by the KDT50 and very short KDT95.

Mortality was total in all tests before the end of 60 minutes of exposure.

These results demonstrate the biological efficacy of aerosol SWORD on the three species tested.

### **The Electric Diffuser SWORD:**

The time of one week does not seem enough to try and confirm its effectiveness. It interest several families and several offices that require more time.

The samples (2 diffusers per family) are stayed in the families and we will have some results by the end of January 2015. The Electric Diffuser is the product of the future with the aerosol.

### **Spirals SWORD:**

The spirals are appreciated and have a good smell of perfume. This product can be sell well especially in low income families in cities. There are a lot of Chinese companies who manufacture very cheaper Spirals in Bamako.

\*\* The Electric Diffuser seems to attract more families and services.

Reviews are positive for more than 60% on the effectiveness of liquid diffuser on mosquitoes.

\*\*\* IMPORTANT NOTE: The appliance is short for our connecting sockets. You can add 2centimeters .

Bamako January 10, 2015

### The investigators

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