EVALUATION OF THE *GREAT® FRUIT FLY BAIT* (GFFB) AGAINST FRUIT FLIES IN TWO MANGO-PRODUCTION ZONES IN GHANA

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INTRODUCTION

- The horticultural industry is one of the most attractive agricultural sectors, and an important source of employment and income generation. However, several factors constrain production, with insect pests as one of the most important. Among the insect pests, perhaps none has gained notoriety than the group known as Fruit Flies.
- Species in this group are reported to cause 40-80% direct losses to fruits and vegetables (Lux *et al.*,2003; Billah et al., 2009). Quarantine restrictions also reduce exports to lucrative markets in Europe, Middle East and USA, where the insects are regarded as quarantine pests..
- It is therefore essential that growers are provided with economically viable management techniques that are sustainable and environmentally-friendly against the pests.
- One such technique is the use of protein baits - which has been demonstrated as effective in many countries, and even accepted in organic farming (OMRI, 2001)
- The product is a mixture of food substance and insecticide that attract and kill fruit flies on consumption of the product .
- This trial was aimed at evaluating and validating the bio-efficacy of the product against fruit flies in two commercial mango production zones.

METHODOLOGY

- **Site Selection, Traps and Attractants**
- Three farms (2 treatment & 1 control) were selected from each of the 2 sites, with 4-10 ha plot sizes and a minimum of 400-600 fruiting trees.
- Spot sprays with the treatment products – Great ® Fruit Fly Bait (GFFB, (Ecoman Biotech Co., Ltd., Beijing, China) and SUCCESS® Appat (GF-120 (GF-120, Dow AgroSciences Ltd., UK)) were applied in the plots.
- Plots were geo-referenced using a Magellan Explorist 100 hand-held device (Table 1).
- Three attractants were used; Methyl eugenol (ME) ; Terpinyl Acetate (TA) and Trimedlure (TML), both for attracting different subgenera of *Ceratitis* species (Plate 2)
- Local Homemade Mineral Water Bottle (MWB) traps were used (Plate 1).

- **Trap Deployment and Bait Application**
- Nine traps (3 ME + 3 TA + 3 TML) were deployed per plot on trees at 2-4 m above ground (Plates 1 & 2).
- GFFB (1L: 3L Water) and SUCCESS® Appat (1L Bait : 5L Water), were delivered at 50ml/tree over 1 m^2 of canopy (Plate 3).
- Treatment repeated on weekly basis till end of harvest, and traps checked on weekly basis for catches.
- After every 4 weeks of exposure, traps were serviced by cleaning and replacing attractants and DDVP.
- **Fruit sampling and Incubation**
- After 8-10 weeks of application, 100 fruits per plot were collected and weighed for incubation over a layer of sand
- After 3-4 weeks of incubation, fruits were dissected to retrieve hidden puparia before discarding. Puparia were held in petri dishes till fly emergence.
- Flies held in cages and fed on diet of yeast + sugar (ratio 1:3) for 4 days to attain full adult features.
- Fruit collection was repeated toward end of harvest.
- **Data analysis**
- Fly numbers were log-transformed [log (x +1)] and subjected to analysis of variance, using PROC GLM.
- Means were separated by SNK test at P = 0.05 (SAS Inc., 2003).
- To compare densities, catches were expressed as Number of flies (F) per trap (T) per day (D) i.e. F/T/D (IAEA, 2003).
- Fruit infestation levels were determined by number of p (weight or number of fruits).

Plate 1. Tephri-Trap.

Plate 2. Attractants
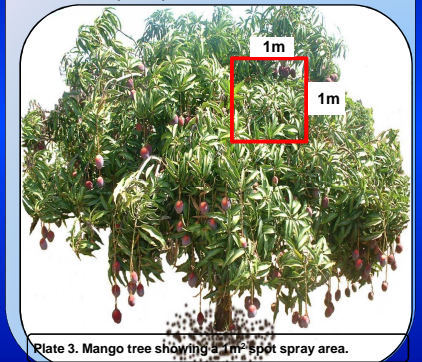
Plate 3. Mango tree showing 1-m² spot spray area.

TABLE 1. Geo-referenced Points of Study Area

Locality	Farm	Farm Owner	Treatment	GPS Readings Lat.	GPS Readings Long.	Alt. (m)
Site 1	Andrews	A. Teikutey	GFFB	05° 59' 09 N	000° 00' 50 E	82
	Epichris 1	C. Olympio	GF-120	06° 00' 20 N	000° 00' 43 E	77
	Epichris 2	C. Olympio	Control	06° 01' 45 N	000° 00' 27 E	68
Site 2	Koldam	K.. Adams	GFFB	06° 03' 24 N	000° 00' 55 W	91
	Sikeway 1	J.F. Awaitey	GF-120	06° 02' 52 N	000° 00' 44 W	94
	Sikeway 2	J.F. Awaitey	Control	06° 01' 38 N	000° 00' 52 W	81

Bactrocera invadens

Ceratitis cosyra

Ceratitis capitata

TABLE 2. Infestation Indices and levels of Protection at the 2 Sites = A, and Combined (B)

Farm	Trt	No. Fruits	Wt (kg)	No. Puparia	Infestation Level Puparia/fruit	Infestation Level Puparia/kg	Difference (C-T)	% Protection (C- T)/C 100
Koldam	GFFB	90	66.0	2	0.022	0.030	0.929	96.8
Sikeway 1	GF-120	90	60.0	11	0.122	0.183	0.776	80.9
Sikeway 2	Control (C1)	90	58.4	56	0.622	0.959		
Andrews	GFFB	90	60.0	3	0.033	0.050	0.728	93.6
Epichris 1	GF-120	90	60.0	10	0.100	0.150	0.628	80.7
Epichris 2	Control (C2)	90	63.0	49	0.544	0.778		

Trt	Fruits	Wt	Puparia	Pup/fruit	Pup/Wt	Diff.	% Protection
GFFB	180	126.0	5	0.028	0.040	0.825	95.4
GF-120	180	120.0	20	0.111	0.167	0.698	80.7
Control	180	121.4	105	0.583	0.865		

RESULTS

- ❖ No. of Fruit flies Collected = 6,057
- ❖ Three (3) fruit fly species identified

1. *Bactrocera invadens* = 5,765 (95.2%)
2. *Ceratitis cosyra* = 191 (3.15%)
3. *Ceratitis capitata* = 101 (1.67%)

Level of Fruit Protection

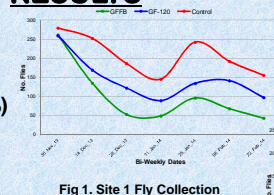1. GFFB fields = **93.6-96.8%**
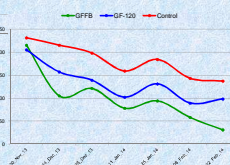2. GF-120 Fields **80.7-80.9%**

Fig 1. Site 1 Fly Collection

Fig 2. Site 1 Fly Collection

DISCUSSION & CONCLUDING REMARKS

Though high trap catches were recorded from treated plots, number of puparia from fruits were low.
- **Implication**: Traps and bait attracted flies away from fruits.
- Statistical differences between catches from the 3 treatments were significant.
- Even though numbers from treated fields tended to fall with time, those from control fields followed same trend.
- It was because control fields were NOT abandoned farms – farmers had their own types of treatments.
- Around 10th week, plots seemed to climb up in both plots – coincides with peak fruiting period when all fruits are mature.
- Most dominant species = *Bactrocera invadens* (>95 %).
- *B. invadens* now Ghana and Africa's biggest Fruit Fly challenge.
- Fruit Infestation levels 0.022-0.033 pup/kg
- Lowest infestation levels = GFFB fields

RECOMMENDATIONS

- Farmers appreciate the simple but effective performance of the product
- But the **non-availability** food baits on the markets makes farmers resort to the use anything they lay hands on
- The need to introduce food baits onto the Ghanaian market is thus paramount
- Food baits highly recommended for inclusion in all fruit fly IPM packages
- With the inclusion of food baits in IPM packages, growers will have the chance of producing **high quality fruits and vegetables** to boost the horticultural industry.

References

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