

Research & Development Department

FORMULATION OF *SCIRPOPHAGA EXCERPTALIS* DIET

Summary

Ramu Agri Industries Limited has formulated Artificial Diets for different stem borers it has except for the *Scirpophaga excerptalis*. Combinations of ingredients from Ramu and Australia gave similar results for the *S. excerptalis* larvae. The larvae of this borer released on these diets fed up to 25 days and died. Ratios for these ingredients would be adjusted and hopefully a diet for this borer would be produced in the future which the larvae would feed from first instars to pupal stage.

Introduction:

Artificial diet is making of a diet in imitation of a natural one. It involves several ingredients to produce one set. The ratios of these ingredients are adjusted several or many times to come up with a suitable diet for the intended purpose. It took well over four years for Ramu Agri Industries Limited (RAIL) to formulate the Artificial Diets which it is using for its stem borers. Larvae of several borers at first instars can be raised from these diets to pupal stage except for *Scirpophaga excerptalis* - Top Shoot Borer (TSB). The first instars of TSB larvae normally feed well in these diets but unfortunately die after five days and never make it to pupal stage like other borers. When large or final instar larvae of TSB were released in the same diet, they fed well and made it to the pupal stage.

Some ingredients used elsewhere in the world were brought in from Australia to produce a diet that may solve this problem. No larvae survived from these ingredients but combination of these with RAIL ingredients enabled the larvae to feed and survive up to 25 days. Within these days the larvae heads did not change as happens naturally.

Large larvae released in to these combinations also survived and pupated

in the diet. The aim of this work was to use these ingredients or a combination with RAIL's to produce a diet that could sustain first instars larvae of TSB through to pupal stage. May be 20 percent of this aim was achieved and is documented in this report.

Methods

Ingredients with their given rates found in Appendix 1 and 2 were all mixed to produce different sets of artificial diets. These sets were evenly mixed using a blender in the laboratory. The mixed solutions were poured in to a square lunch box container. When these became solid like a cake they were cut in to small cubes which were put in to 10.5 x 2.5 cm plastic test tubes with crew caps. First and late instar larvae of TSB were released in to these test tubes with the cubes (Diet). Dead larvae were removed and live ones were kept through and their survival days were recorded.

Results & discussions

A total of eighteen (18) combinations or diet sets were produced so far. Diet sets 1 – 13 were produced using RAIL ingredients and formulation 2016 – 01 and 2016 – 02 were produced using RAIL ingredients combined with one or two ingredients brought in from Australia (SRA). Brewers yeast was used in combination 2016 – 01 and 2016 – 02. Ground chickpea was used only in formulation 2016 – 02 (Appendix 1 & 2).

The first instar larvae inoculated on diet formulations 1-13 (RAIL diets) survived up to five days on average. This has changed in diet formulation 2016 – 01 and 2016 – 02. The first instar larvae inoculated on these diet formulations survived beyond five days. In combination 2016 – 01(Appendix 1), with brewer's yeast, three 1st instars larvae were inoculated. Of these three, only one larva made it to 17 days. This combination was repeated and this time ten first instar larvae were released on the diet. Only one from the ten larvae survived up to 25 days (Table 1).

Some 26 large larvae of TSB collected from the fields were released on to combination 2016 - 01 to see their survival on this diet formulation (Appendix 1). They all fed well and survived for up to 35 - 41 days. From these seven of them successively emerged into adults whilst the rest died at pupal stage. This could be due to some bacterial or fungal infections (Table 1).

Some 38 first instar larvae of TSB were inoculated in diet Formulation 2016 – 02 (Appendix 2). These first instar larvae survived for over 20 days and died like others in the previous diets (Table 1).

Table 1 Artificial Diet formulations with larvae numbers and their survival days

Formulation	Date	No. of larvae used	Instars used	Survival days	Larvae survived	Comments
2016 - 01	13/5/16	3	1 st	17	0	Head not changed
2016 – 01	13/5/16	10	1 st	25	0	Head not changed
2016 - 01	13/5/16	26	Matured	35-41	7	2 x M, 5 x F
2016 - 02	12/6/16	38	1 st	20	0	Head not changed

Key: M = Male & F = Female

So far none of the first instars survived to final instars and pupal stage. Those that fed in different diet ratios survived for some days as stated above and died. When large larvae of TSB were fed in diet formulation 2016 – 01 they survived to pupal stage and seven moths emerged out of the 26 larvae. Others died at pupal stage. This could be due to fungal infections.

These results may mean that TSB larvae can feed and survive in these ingredients but it needs fine turning down to a ratio that can get the first instars through to the final instars.

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Appendix 1 Ingredients with their rates used to produce the Artificial Diet “Formulation 2016 - 01” for both 1st and late instars larvae of TSB

Ingridents	Rates (g)
Brewers yeast (ASR)	20
Sugar Cane Shoot Powder	40
Sugar Cane Leaf Powder	10
Sugar Cane Juice	100
Cheak Pea	50
Flame Flower	20
Sucrose	30
Casein	15
Agar	8
Ascobic Acid	1.5
Sobic Acid	0.5
Cholesterol	0.7
Methyl 4-hydroxy Ben	1
Formaldehyde 2%	12 drops
Linseed oil	12 drops
Vitamin E	1 caps
Maltivitamin	1 caps
Tap Water	350ml
Mancozeb DF fungicide (ASRA)	0.14

Appendix 2 Ingredients with their rates used to produce the Artificial Diet “Formulation 2016 – 02” for 1st instars larvae of TSB

Ingridents	Rates (g)
Brewers yeast (ASR)	20
Sugar Cane Shoot Powder	35
Sugar Cane Leaf Powder	10
Sugar Cane Juice	100

Ground Chick Pea (ASRA)	50
Flame Flour	10
Sucrose	25
Casein	15
Agar	4
Ascobic Acid	1.5
Sobic Acid	0.5
Cholesterol	0.7
Methyl 4-hydroxy Ben	1
Formaldehyde 2%	12 drops
Linseed oil	12 drops
Vitamin E	1 caps
Maltivitamin	1 caps
Tap Water	350ml
Mancozeb DF fungicide	0.14