DEPARTMENTAL EXPERIMENT
DEPARTMENT OF ENTOMOLOGY,
NMCA, NAU, NAVSARI (GUJARAT)

CJA approval No.: 16.3.3.69	**Bioefficacy of bioformulations against maize Fall armyworm, *Spodoptera frugiperda* (J.E. Smith) under South Gujarat conditions**
Background information:	The Fall Armyworm (FAW), *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), is an invasive pest of maize. In 2018, this notorious pest has been reported in India and the same pest is also reported in Gujarat state and causes severe yield loss. It is assumed that botanicals play a vital role in IPM programme and it will support the sustainable pest management. As per the latest information in the Gujarat state regarding pest management through bioformulations, several biological products such as *Brahmastra*, *Agniastra*, *Neemastra*, *Dashparni ark* and garlic + ginger + mint mixture are the indigenous bio-products are expected to be effective in the controlling various insects-pest in organic farming. Therefore, these products need to evaluate for effective management of *S. frugiperda*. This trial is proposed as per the instructions of Hon. Director of Research, NAU, Navsari with the following objective,
Objective:	To evaluate the bioefficacy of bioformulations against the *Spodoptera frugiperda* (J. E. Smith)
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Associates:	Research Fellows
Location:	College farm, NMCA, NAU, Navsari
Agro-climatic zone:	South Gujarat Agro-climatic Zone II- AES III
Name of Res Scheme &B.H.:	Departmental trial B.H. 12939
Commencement year & Experiment year:	Commenced from 2020-21 2020-21 (Conducted) 2021-22 (Vitiated) 2022-23 (Vitiated) 2023-24 (Continue)

Experimental Details:

1.	Location	:	College farm, NMCA, NAU, Navsari-396450
2.	Year and Season (if applicable)	:	2023-24 and *Rabi*
3.	Crop and Variety (if applicable)	:	Maize (Sweet corn; Sugar-75)
4.	Design	:	Randomized Block Design (RBD)
5.	No. of treatment and replication	:	Treatments: 6

			Replications: 4
6.	Plot size	:	Gross plot: 3.6 m X 4 m = 14.4 m^2 Net plot: 2.4 m X 3.2 m = 7.68 m^2
7.	Seed rate	:	12 kg/ha
8.	Spacing	:	60 cm X 20 cm
9.	Manures and fertilizer	:	150:60:00::N : P :K kg/ha
10.	Soil	:	Heavy Black soil

Details of Treatments:

Tr. No.	Treatment details	Conc. (%)	Dose (ml/g) in 10L
T_1	*Dashparni ark*	10	1000 ml
T_2	*Agniastra*	10	1000 ml
T_3	*Neemastra*	10	1000 ml
T_4	*Brahmastra*	10	1000 ml
T_5	Garlic + ginger + mint mixture	10	1000 ml
T_6	Control (Untreated)	--	--

Methodology:

- To evaluate the bio efficacy of insecticides, maize crop will be sown in *rabi* season by adopting all recommended agronomical practices except insecticides.
- Application of treatments will be made after the infestation of fall armyworm on maize.
- Application will be done as a foliar coarse spray after adjusting the nozzle so that, it will cover the entire crop canopy/whorl region of crop by battery operated knapsack sprayer.
- The number of damaged as well as healthy plants will be counted in net plot area.
- Observations will be taken before the application, 3, 5, 7 and 9 days after application from each treatment and replication. Further, second, third and fourth application will be given after 10 days of first application and same observations will be taken as per first application. Thus, total four spraying will be made in the present investigation.
- Picking of sweet corn cobs will be carried out when sweet corn cobs will be ready for harvest. No. of damaged cobs will be recorded and per cent damaged cob will be worked out.
- Picking date wise yield of sweet corn cobs will be recorded from each net plot area.
- The cob yield of sweet corn in kg per net plot will be converted to quintal per ha.
- After final picking, the green fodder yield will also be recorded from each net plot area and it will be converted into quintal per ha.
- The data thus obtained will be analyzed statically with appropriate statistical tools.

Observations to be recorded:

- Number of healthy and damaged plant per plot
- No. of damaged cobs

	• Sweet corn cob yield (quintal /ha) • Green fodder yield (quintal /ha)

T1. Dashparni Ark:

Sr. No.	Natural product and their ingredients	Quantity
1.	Neem (*Azadirachta indica*) leaves	5 kg
2.	Karanja (*Millettia pinnata*) leaves	2 kg
3.	Nirgundi (*Vitex negundo*) leaves	2 kg
4.	Custard apple (*Annona reticulata*) leaves	2 kg
5.	Papaya (*Carica papaya*) leaves	2 kg
6.	Castor (*Ricinus communis*) leaves	2 kg
7.	Ratangunj tree (*Adenanthera microsperma)* leaves	2 kg
8.	Calotropis (*Calotropis gigantea*) leaves	2 kg
9.	*Nerium indicum* leaves	2 kg
10.	Indian bael tree (*Aegle marmelos*) leaves	2 kg
11.	Green chilli (*Capsicum annuum*) paste	2 kg
12.	Garlic (*Allium sativum*) paste	250 g
13.	Cow urine	5 L
14.	Cow dung	3 kg
15.	Water	200 L

Dashparni Ark preparation procedure:

Known quantity of detached neem leaves, karanja leaves, nirgundi leaves, custard apple leaves, papaya leaves, castor leaves, Ratangunj tree leaves, Calotropis leaves, *Nerium indicum* leaves, Bael tree leaves, green chilli paste, garlic paste, cow dung, cow urine will be taken and added into 200 litre water (200 litre plastic drum) and it will be kept to ferment for one month. For the preparation of solution, another plastic drum of 200 litre capacity will be also used to mix all the ingredients and thereafter solution will be transferred to final drum. The dashparni ark solution will be taken out from the plastic drum by extracting the entire solution after filtering through muslin cloth. The extracted solution will be kept in final drum under shade condition (B/H Biocontrol lab) and covered with green shade net. The prepared Dashparni Ark solution will be stirred by using bamboo stick regularly for at least three times a day.

T2. Agniastra:

Sr. No.	Natural product and their ingredients	Quantity
1.	Neem (*Azadirachta indica*) leaves pulp	5 kg
2.	Ipomoea leaves paste	1 kg
3.	Green chili (*Capsicum annuum*) leaves paste	500 g
4.	Garlic (*Allium sativum*) paste	500 g
5.	Cow urine	10 L

Agniastra preparation procedure:

For the preparation of Agniastra, 10 L of cow urine will be poured in plastic drum; thereafter paste of Ipomoea crushed leaves @ 1 kg will be added. Crushed 500 g of green chilli will be added in cow urine. Crushed 500 g of garlic will be added in cow urine and then 5 kg neem leaves pulp will be also added. All the natural ingredient will be ground with the help of electric mixture for the preparation of paste/pulp. All the ingredients will be taken into 26” capacity aluminum tope (*Tapela*) [113 litre capacity] and kept it on gas stove attached with domestic cylinder. The collected ingredients will be boiled 5 times continuously till it became half

quantity. Thereafter, this boiled solution will be kept for cooling and fermentation purpose for the period of 24 hrs. After fermentation, the prepared Agniastra will be filtered through muslin cloth. The extracted Agniastra solution will be kept in final drum (30 litre capacity plastic drum) under shade condition (B/H Biocontrol lab) and covered with green shade net. The final prepared Agniastra solution will be stirred by using bamboo stick regularly at a one-day interval.

T3. Neemastra*:*

Sr. No.	Natural product and their ingredients	Quantity
1.	Neem (*Azadirachta indica*) leaves pulp	5 kg
2.	Cow urine	5 L
3.	Cow dung	5 kg
4.	Water	100 L

Neemastra preparation procedure:

For the preparation of Neemastra, 100 L water will be taken into plastic container (200 litre capacity). Thereafter, 5 L cow urine will be added in it and 5 kg local cow dung will be also added in it. Then, crushed 5 kg neem leaves paste will be added in water. All the natural ingredient will be ground with the help of electric mixture for the preparation of paste/pulp. Thereafter, this prepared solution will be kept to ferment for 24 hrs. After fermentation, the prepared Neemastra will be filtered through muslin cloth. The extracted Neemastra solution will be kept in final drum (30 litre capacity plastic drum) under shade condition (B/H Biocontrol lab) and covered with green shade net. The final prepared Neemastra solution will be stirred by using bamboo stick regularly for at least twice a day.

T4. Brahmastra*:*

Sr. No.	Natural product and their ingredients	Quantity
1.	Neem (*Azadirachta indica*) leaves pulp	3 kg
2.	Karanja (*Millettia pinnata*) leaves pulp	2 kg
3.	Castor leaves pulp	2 kg
4.	Papaya leaves (*Carica papaya*) pulp	2 kg
5.	Guava leaves (*Psidium guajava*) pulp	2 kg
6.	Cow urine	10 L

Brahmastra preparation procedure:

For the preparation of Brahmastra, 10-liter cow urine will be taken into plastic container. Thereafter, crushed neem leaves paste @ 3 kg will be added in water. Then 2 kg pulp of karanja leaves, 2 kg pulp of castor leaves, 2 kg pulp of papaya leaves and 2 kg pulp of guava leaves will be added in it. All the natural ingredient will be ground with the help of electric mixture for the preparation of paste/pulp. All the ingredients will be taken into 26" capacity aluminum tope (*Tapela*) [113 litre capacity] and kept it on gas stove attached with domestic cylinder. The collected ingredients will be boiled 5 times continuously. Thereafter, this boiled solution will be kept for cooling and fermentation for 24 hrs. After fermentation, the prepared Brahmastra will be filtered through muslin cloth. The extracted Brahmastra solution will be kept in final drum (30 litre capacity plastic drum) under shade condition (B/H Biocontrol lab) and covered with green shade net. The final prepared Brahmastra solution will be stirred by using bamboo stick regularly at a one-day interval.

T5. Garlic + Ginger + Mint mixture:

Sr. No.	Natural product and their ingredients	Quantity
1.	Ginger (*Zingiber officinale*) paste	600 g
2.	Garlic (*Allium sativum*) paste	600 g
3.	Mint (*Mentha* sp.) leaves paste	600 g
4.	Water	1800 ml

Garlic + ginger + mint mixture preparation procedure:

For the preparation of Garlic + ginger + mint mixture, 600 g each of ginger, garlic and leaves of mint paste will be taken and added into 1800 ml of water. All the natural ingredient will be ground with the help of electric mixture for the preparation of paste. Thereafter, this prepared mixture will be kept to ferment for 24 hrs. After fermentation, the prepared mixture will be filtered through muslin cloth. The extracted solution will be kept in final drum (30 litre capacity plastic drum) under shade condition (B/H Biocontrol lab) and covered with green shade net. The final prepared solution will be stirred by using bamboo stick regularly for at least thrice a day for next two days.

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