



## **SUCCESS STORY OF RKVY PROJECT**



**“Establishment of bio-control laboratory for mass production of bio-agents”**



**Sponsored by: Rashtriya Krishi Vikas Yojana**

**Implemented by: Department of Entomology, JAU, Junagadh**

**Commencement year: November 2008**

## **SUCCESS STORY OF RKVY PROJECT**

1. **Project** : Establishment of bio-control laboratory for mass production of bio-agents.
2. **Objectives** : This project has been implemented with the main aims as follows
  - i) Multiplication of indigenous potential macrobioagents (parasitoids and predators) of key pests.
  - ii) Multiplication of microbioagents (fungi and viruses) of key pests.
  - iii) Storage and application technology for bio agents.
3. **Sponsored by** : Rashtriya Krishi Vikas Yojana
4. **Implemented by** : Department of Entomology, Junagadh Agricultural University, Junagadh.
5. **Budget** : Total Budget - Rs. 145.00 lakh

(Rs. In Lakh)

<b>Years</b>	<b>Allocation</b>	<b>Release</b>	<b>Expenditure</b>
2008-09	74.25	60.03	60.03
2009-10	22.25	35.33	35.33
2010-11	24.75	25.57	25.57
2011-12	23.75	21.75	21.75
2012-13	-	2.00	2.00
<b>Total</b>	<b>145.00</b>	<b>144.68</b>	<b>144.68</b>

6. **Year of commencement** : November 2008
7. **Completion of civil work** : December 2009
8. **Faculty members associated** : 1) Dr. M. N. Kapadia, Professor & Head (Principal Investigator)  
2) Dr. D. M. Jethva, Assistant Professor (Co-Investigator)

### **Situation/Background:**

In Saurashtra region, cotton, groundnut, sugarcane, mango, coconut and other fruit crops are being cultivated in the irrigated pockets of Saurashtra. The preliminary investigation on natural enemies and detection of the potential bioagents of some major insect pests of crops has been made. The microbial agents like

*Bacillus thuringiensis* (B.t.) and Nuclear Polyhydrosis Virus (NPV) have been evaluated against important crop pests and recommended for the farmer's community. The recommendations have been made to use the safer insecticides and method to conserve the important predators. Farmers of this region have been advised to use the appropriate bioagents for eco-friendly insect pest management.

There is a great short supply of the sufficient amount of bio-agents being demanded by the farmers. Hence, to meet the market demand and timely supply of the bioagents like *Trichogramma*, *Chrysopa*, NPV, *Beauveria bassiana*, *Verticillium lecanii* etc. to the farmers, mass production of such bioagents is highly required. With establishment of this project, production of potential bio-agents will be made and provided to the farmers for the bio-intensive insect pest management in the crop.

### **Backdrop (genesis):**

The use of synthetic pesticides cause residual problem, hence ecofriendly approaches for the management of the insect pests in cultivated crops of Saurashtra region viz., cotton, groundnut, sugarcane, mango and coconut by mass production of indigenous strains of biopesticides. These management objectives have been carried out by multiplication of indigenous potential macro and microbioagents and selling to farming community of Saurashtra region.

### **Objectives:**

This project has been implemented with the main aims as follows

1. Multiplication of indigenous potential macrobioagents (parasitoids and predators) of key pests.
2. Multiplication of microbioagents (fungi and viruses) of key pests.
3. Storage and application technology for bio agents.

### **Importance (Project):**

Isolation of native strains of macro and micro bioagents by developing good quality formulation of bioagents for insect pests management. This can be achieved by production of quality bioagents and microbial pesticides supplied to the farmers as per their requirement at reliable price. These tasks will bring increasing the yield, reduction of insect pests and reducing environmental pollution which can reduce threat to global warming.

## Programme Activities:

### 1. Step taken to carry out the programme

- a. Mass rearing of the effective bioagents will be made in laboratory as per standard method and amount of bio-agents will be provided to the farmers as per their requirement.

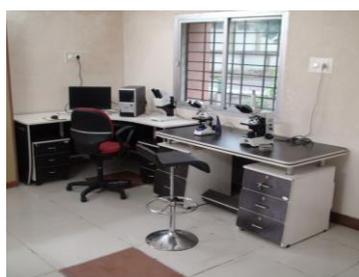
#### b. Activity chart

	Activity	Time period (year)
1.	Construction of building and purchase of required equipments	1 <sup>st</sup> year
2.	Mass rearing of bioagents	2 <sup>nd</sup> to 4 <sup>th</sup>

### 2. Steps taken to fulfill the objectives:

No such type of biocontrol laboratory is existed in Saurashtra region and thus it has more value to encourage the bio-intensive pest management. Well experienced faculty members of entomology department are associated with RKVY project in addition to their prevailing teaching / research duties. Project is running in fourth year and notable achievements in quantity and quality are described here.

- 1. Project facilities:** Isolation room, Incubation room, insect rearing room, Hi-fi microscope, video camera, air-conditioned conference hall, computer cell, refrigerator, oven, deep freezer, laminar air-flow, *Chrysopa* and *Corcyra* rearing device, heaters, generator, liquid fermentor, filling, sealing and packaging machines.



Hi-fi microscope with computer



Oven



UV light sterilization chamber



*Corcyra* rearing unit



Isolation and inspection of entomopathogens



Bottle filling machine



Bottle sealing machine

## 2. Works done

### A. Study on entomopathogens



Microscopic examination of entomopathogens

Soon after the approval of project, works in relation to objectives has been started, in fact, the laboratory of entomology department was used initially until the project civil works to be complemented. The samples of diseased insects from the various fields were collected and the entomopathogens were isolated, growth on media and the pure culture was conformed for its species. The four entomopathogens, *Beauveria bassiana*, *Verticillium lecanii*, *Metarhizium anisopliae* and *Nomuraea rileyi* are judged and its pure cultures have been maintained on the ideal media.

### B. Production of parasite / predators

The mass rearing of the laboratory host, *Corcyra cephalonica* has been started in the RKVY biocontrol laboratory during March, 2010. The eggs of *Corcyra* produced in mass are used for the multiplication of the egg parasitoids,



*Chrysoperla* rearing cage

*Trichogramma chilonis* and the potential predator, *Chrysoperla carnea*. Total 600 tricho cards (each cards contains 10000 *Corcyra* eggs parasitized by *Tichogramma*) has been produced. Now such cards are provided on reliable cost to the farmers, who desire to release in fields. The advance order of its demand

will be attended. In these days the mass multiplication of these bioagents is under smooth running. The mass rearing of important biogents, *Chrysoperla carnea* has been initiated during December, 2010 and is in progress.



Rearing unit for mealybug and its predator

The initial stock culture of cotton mealybug predator, *Cryptolaemus montrouzieri* procured from the reputed agricultural university was used to multiply in biolab RKVY, Junagadh during the May, 2009. The mass culturing of the cotton mealybug was also raised on the potatoes with view to rear its predators. The study

on its development and bioagents was also done. The adults of this predator will be liberated in the mealybug infested field of cotton in Saurashtra region, and its establishment in the local condition will be determined.

### C. Production of NPV



Rearing unit of *Spodoptera*

For the production of *Spodoptera litura* NPV, mass rearing of this polyphagous pest has been made in laboratory using the natural food (castor leaves) during September, 2010. Total 50000 larvae of *Spodoptera* were reared and used for viral infection by which NPV production has been obtained. Total 125 lit

crude suspension of NPV to the tune of 50000 LE, from which the commercial product is prepared and branded as SAWAJ SNPV and SAWAJ HNPV. Each bottle of NPV 250 ml liquid amount represents 100 LE. One LE contains 10 million viral particles.

## 3. Education / Training programme

**A. UG/PG teaching:** The courses related to biological control of crop pests are being taught by the Department of Entomology. The biolab developed under RKVY project becomes most useful practical learning to the UG/PG students. The post graduate students are also working in this laboratory for their research problems related to the biocontrol aspects.



Conference Hall

**B. Staff training:** One assistant professor of this department have attended 21 days training on

multiplication of biopesticides and biotechnology for insect pests and diseases at NBAII, Bangalore, December, 2011.

**C. Awareness:** A conference hall facilitated with audio visual systems has been utilizing for training programme under RKVY. The farmers have been familiarized with the importance of bioagents tools in pest managements. The extension workers are also trained to encourage the farmers for bio pest management strategies.



**Insect museum**

extensionists, farmers and scientists are benefited.

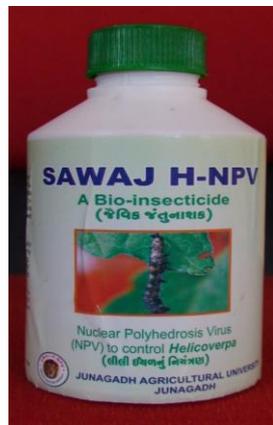
#### **4. Research Activity:**

In addition to the bioagents production programme, simultaneously need base research have been carried to improve and efficient rearing techniques in regards to meet qualitative and quantitative speedy production of potential bioagents. We have developed *Corcyra* rearing device to obtain the huge eggs with less labour and times.

Cold storage techniques for a predator *Coccinella septempunctata*, *Chrysoperla carnea*, *B. bassiana* and NPV is standardized. The findings of these studies will be useful in determining the effective durability of the products.

### **Results/Outcome:**

1. Commercial product of SNPV(SAWAJ S-NPV) and HNPV (SAWAJ H-NPV) has been launched 2010-11 and now it is under smooth running and it is commercially distribution to the farmer community.



**SAWAJ HNPV**



**SAWAJ SNPV**

2. Local strains of four entomopathogens has been isolated and maintained its pure cultures.
3. *B. bassiana* is cultured on solid and liquid media. The skill pertaining to talc based production and processing of Bb is developed. Pure culture is being maintained. The pre-requirements for producing Bb product have been fulfilled and its commercial products are to be started in short time.



STOCK CULTURE STORAGE



SAWAJ BEAUVERIA

4. Mass production of *Corcyra cephalonica* and *Trichogramma chilonis* is in progress and skill regarding its production is developed.



Mass rearing of *Trichogramma*

5. Production of *Chrysoperla carnea* has been started.
6. Mealybug predator, *Cryptolaemus montrouzieri* has been affording for its mass rearing to release in field.

7. Testing for field and laboratory efficacy of local strains of *B. bassiana*, *V. lecanii* and *N. rileyi* as well as NPV against *S. litura* in groundnut and cabbage is under experimentation.
8. A modified device for mass collection of *Corcyra cephalonica* moths and eggs has been proved to less laborious and time period.



Modified device for *Corcyra* collection

9. The Coccinellid predator *Coccinella septempunctata* can successfully be stored in domestic refrigerator upto 4.5 months.
10. PG scholars (entomology) are utilizing the RKVY biolab for their theses research programme.
11. UG and PG practicals related to biocontrol courses are also undertaken in this laboratory.
12. The selling of TRICOCARD (*T. chilonensis*) and CHRYSO CARD (*C. carnea*) are also initiated.

## 9. Future programme

- 1) Entomophage park will be established.
- 2) Large scale demonstration of the produced bioagents will be arranged.
- 3) Standardization of bioagents products and its production methods will be afforded.
- 4) Mass culturing of *V. lecanii*, *N. rileyi* will be attempted.
- 5) Storage and conservation of bioagents will be developed and demonstrated on farmers fields.
- 6) Small scale biofactory based on mini unit cultivation of crops which strongly supports the host insects resulting into naturally multiplication of the bioagents will be identified and advised to farmers.
- 7) Study on storability of prominent macro and micro bioagents, its compatibility with insecticides / fungicides will be undertaken.
- 8) Awareness among farmers and extensionists to adopt the biointensive insect pest management as well as technology in case of NPV will be expanded through extension machinery.

- 9) Efforts will be made to introduce the exotic bioagents in local nature.
- 10) Experience/ knowledge exchange at national and international level will be strengthened for making more effective RKVY programme.

#### 10. **University remarks**

- 1) The biocontrol lab established under RKVY project becomes helpful in improving the teaching quality especially biocontrol practical being taught to UG / PG students as well as facilitates to carry out the PG research programmes related to biocontrol aspects.
- 2) The university scientists have been succeeded to isolate the four entomopathogens which are to be proved superior in the virulence to the presently available commercial products.
- 3) The bioinsecticides products to be produced directly under sound technical guidance and supervision of the scientists would truthfully encourage/ motivate the farmers community for the low cost ecofriendly pest management.
- 4) Our scientists intend a strong to produce the qualitative and quantitative commercial products as maximal and in minimal time period by utilizing the RKVY biocontrol laboratory facilities to meet the demands of farmers, NGO, and sugarcane factories.
- 5) The awareness regarding biocontrol tools is to be perpetuated among farmers through extension machinery and news media.
- 6) It is strongly believed that the farmers may adopt the biocontrol products as alternatives of insecticides and serves the purpose of RKVY project.

Pamphlet for how to use the NPV products (In Gujarati)

**સાવજ એસ-એનપીવી**

**ઉપયોગ** ઘરઠી ઉપલ (પોરેનીયા) એ બહુભોજી જીવાન છે. તે મગજની, કપાસ, એરંડા, કોબી, કોબી ફલાવર, ટમેટી, ડુંગળી, તમાકુ વિગેરે પાકોને નુકસાન કરે છે.

**વાપરવાની રીત** સાવજ એસ-એનપીવી વાપરતાં પહેલાં બરબર હલાવવું, હેક્ટરે ૪૫૦ ઉપલ આંક પ્રમાણે વાપરવું, એટલે કે સાઝવાર બોટલ (૨.૫ મીલી દ્રાવણ= ૧ એલઈ).

સાવજ એસ-એનપીવી (સ્પોરોષ્ટેરા નુકલીયર પોલીદ્રોસીસ વાયરસ) એ ઘરઠી ઉપલને જ રોગ લગાડી નિર્મોલ કરવું વિષાણું (વાયરસ) અધારિત જૈવિક જંતુનાશક છે. તે માનવ, પશુપત્ની, ઉપલોની કિટકો તેમજ પર્વાત રાજ માટે બિનઝેરી-સલામત જંતુનાશક છે. એક ઉપલ આંક (એલઈ) જગ્યામાં આશરે ૧૦૦ કરોડ વાયરસ કણો હોય છે. સૂર્યના તીવ્ર કિરણોની હાજરીમાં વાયરસ કણોની સક્રિયતા ઘટે છે. તે કોઈપણ રાસાયણિક જંતુનાશક સાથે વાપરી શકાય છે. ઠંડી અને અંધારી જગ્યામાં એકાદ વર્ષ સુધી સંચરી શકાય છે.

**પ્રાપ્તિ સ્થાન :**  
આયોકેટોલ લેબોરેટરી, કિટકોશ્વર વિભાગ, જુનાગઢ કૃષિ યુનિવર્સિટી,  
જુનાગઢ-૩૬૨૦૦૧ સેન નં.(૦૨૮૫) ૨૬૭૨૦૮૦-૮૦  
પીબીએસ-૩૧૩/૩૫૮/૧૮૦

**સાવજ એચ-એનપીવી**

**ઉપયોગ** ઘીલી ઉપલ (લેલીબોલીસ) એ બહુભોજી જીવાન છે. તે મગજની, કપાસ, તુવેર, વણા, ટમેટી, બાજરી, વાણ, વટણા, મરચી વિગેરે પાકોને નુકસાન કરે છે.

**વાપરવાની રીત** સાવજ એચ-એનપીવી વાપરતાં પહેલાં બરબર હલાવવું, હેક્ટરે ૨૫૦ ઉપલ આંક પ્રમાણે વાપરવું, એટલે કે આઠ બોલ (૨.૫ મીલી દ્રાવણ= ૧ એલઈ).

સાવજ એચ-એનપીવી (લેલીબોલીસ વાયરસ) એ ઘીલી ઉપલને જ રોગ લગાડી નિર્મોલ કરવું વિષાણું (વાયરસ) અધારિત જૈવિક જંતુનાશક છે. તે માનવ, પશુપત્ની, ઉપલોની કિટકો તેમજ પર્વાત રાજ માટે બિનઝેરી-સલામત જંતુનાશક છે. એક ઉપલ આંક (એલઈ) જગ્યામાં આશરે ૧૦૦ કરોડ વાયરસ કણો હોય છે. સૂર્યના તીવ્ર કિરણોની હાજરીમાં વાયરસ કણોની સક્રિયતા ઘટે છે. તે કોઈપણ રાસાયણિક જંતુનાશક સાથે વાપરી શકાય છે. ઠંડી અને અંધારી જગ્યામાં એકાદ વર્ષ સુધી સંચરી શકાય છે.

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જુનાગઢ-૩૬૨૦૦૧ સેન નં.(૦૨૮૫) ૨૬૭૨૦૮૦-૮૦  
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**Dignitaries' visit**



Dr. Subramanyan, RKVY consultant, New Delhi discussed with JAU scientists (24/02/2010)



Tanzania team interacted with scientists (26/07/2010)



Dr. Bidari, NIRM, Hyderabad and Dr. N.C. Patel, vice chancellor, JAU, Junagadh (28/08/2010)



Dr. Bidari viewing operation of fermenter (28/08/2010)



Dr. Bidari interacted with Dr. N. C. Patel, VC, Dr. Dangaria, DR and Scientist, JAU (28/08/2010)



South Africa team looks the working fermenter (06/12/2010)



South Africa team be acquainted with *Corcyra* rearing techniques (06/12/2010)

## Exposure of bio-pesticides product by news media

# Now, bio-pesticides for pest control

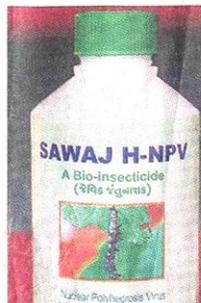
Junagadh Agricultural University To Launch The Product For Farmers

Vijaysinh Parmar | TNN

**Junagadh:** The Junagadh Agricultural University (JAU) will launch two bio-pesticide products under the brand name of 'Sawaj' (Lion) on January 15, when the JAU's convocation will be held.

According to N C Patel, vice-chancellor, JAU, the bio-pesticide products will kill pests in different crops effectively and being eco-friendly they will not harm farmers while spraying.

"Our scientists have tested them on different crops and found that the results are encouraging. We have al-



Sawaj' (Lion) the bio-pesticide

grams for farmers on how to use these pesticides," in their farms, Patel said.

Patel said that Savaj HNPV prevents the *Helicoverpa armigera* in different crops while Savaj SNPV controls the *Spodoptera litura* in different crops.

"We will see the farmer's experience on large scale and accordingly we will continue to produce it in our Microbial Insecticide Production Unit at JAU," he added.

JAU officials say that bio-pesticide will be in liquid form and each tin will contain 250 ML. "SNPV works against the *S Litura*, a pol-

lyphagous pest which damages cotton, castor, cabbage, groundnut, cauliflower and tobacco.

Farmers use chemical insecticides indiscriminately to manage the pests but it also creates environmental problems. But bio-pesticide

is safer and eco-friendly," said M N Kapadia, professor and head of entomology department, JAU.

"Every year, many farmers die after inhaling pesticides while spraying them. But bio-pesticides are harmless and will also save the human lives as well," said Kapadia.

