

Myco-Jaal

*A novel formulation of **Beauveria bassiana**
for the management of diamondback moth on
cole crops in Indian scenario*

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Cole Crops-Indian Scenario

■ *India*

- *is an agrarian country (5.1 million ha area under vegetable cultivation and 81 million tonnes production/year)*
- *is the second largest producer of vegetables in the world (Global share 13.4%)*
- *Crucifers form an important part of this sector*
- *most inexpensive sources of rich nutrients for Indians*
- *0.438 million ha under cultivation and annual production of 6.3 million ton*
- *recent burgeoning demand of exotic varieties for export*





Pest status of Diamondback Moth

- **DBM : key pest of all crucifers worldwide**
- **Annual cost for management >US\$1billion (Talekar & Shelton 1993)**
- **Developed resistance against synthetic chemicals and even Bt toxin**
- **Over usage of effective chemical affects the product life**
- **Indian scenario (Chadda 2006)**
 - 35-90 % loss estimated on cabbage & cauliflower
 - Pesticide consumption >25% of total cultivation cost
 - US\$34million annual consumption of insecticide on cabbage

Biological based insecticides are the sole alternatives





Myco-Jaal

(India's first oil based mycoinsecticide)

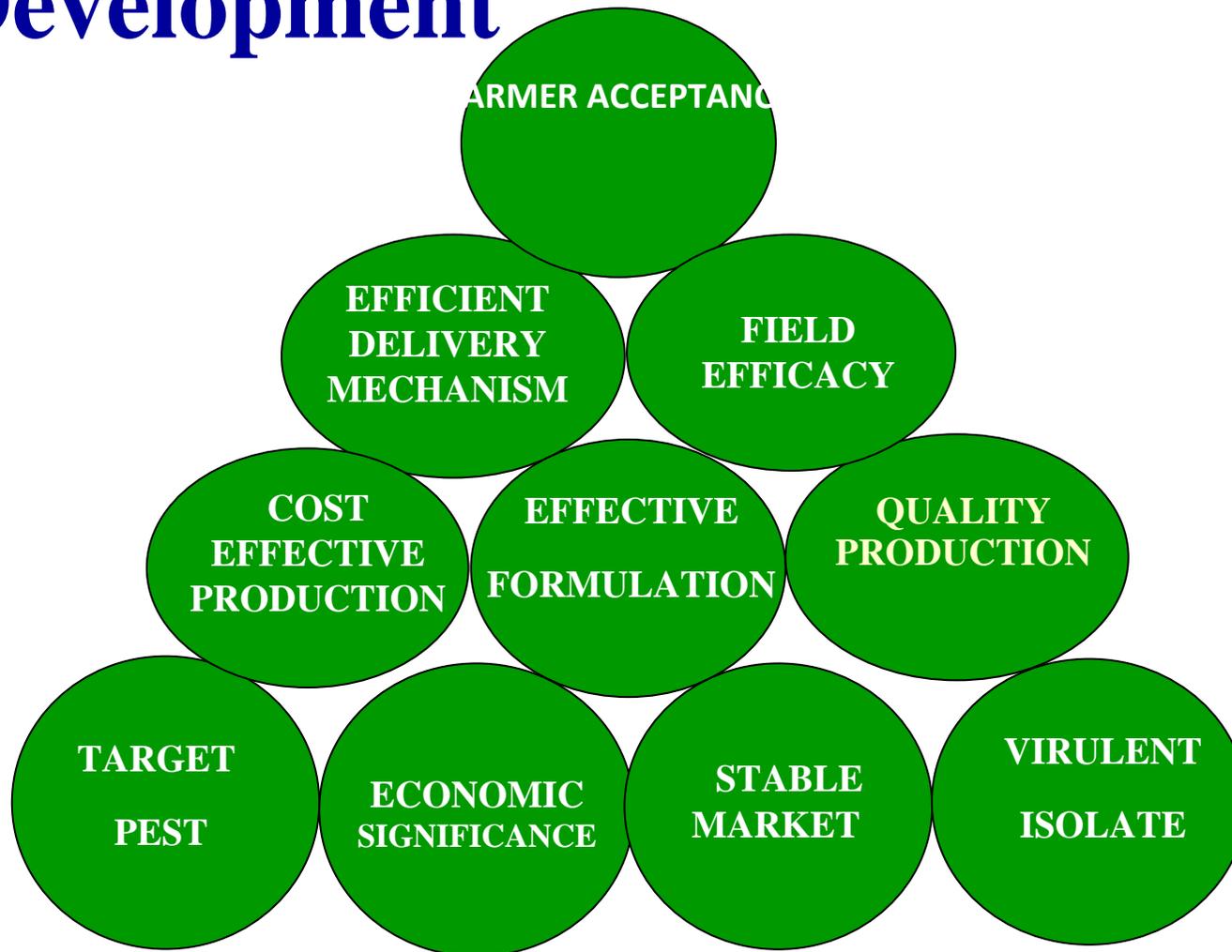


- **Suspension Concentrate formulation of aerial conidia of *Beauveria bassiana***
- **Registration no.: CIR-623/2006 (269) *Beauveria bassiana* (SC)-11**
- **Specification:**
 - **Colour : Light brown**
 - **Colony forming units - 1×10^{10} /ml**
 - **Shelf-life- One Year at room temp**
 - **Other contaminants level: $<1 \times 10^2$ /ml**
 - **Bacterial pathogenic contaminants :Nil**
 - **Application Rate: 5×10^{13} conidia/ha**

Myco-Jaal is a organically certified product



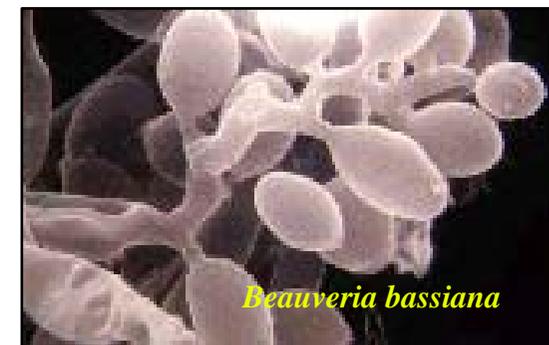
Challenges in Myco-Jaal Development





Importance of strain selection

- *Selection of virulent isolate*
 - 12 isolates of *Beauveria bassiana*
 - 4 isolates of *Metarhizium anisopliae*
 - 2 isolates of *Paecilomyces fumosoroseus*
- *Beauveria bassiana* isolated from DBM cadaver was found suitable
- DBM culture established under lab condition
- A process of repeated exposure, isolation and purification followed over 50 generation.
 - Isolate turned more selective to DBM
 - Improved virulence from 40.00% to 90.00%

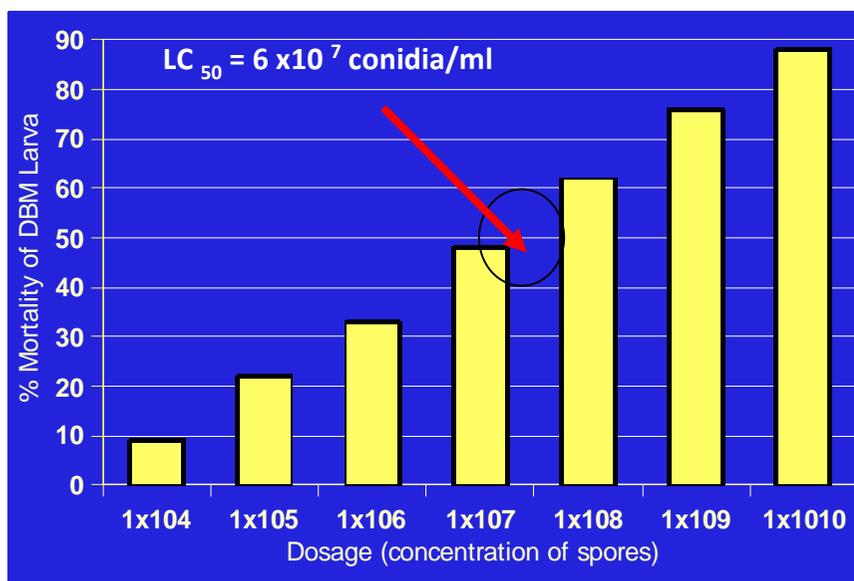




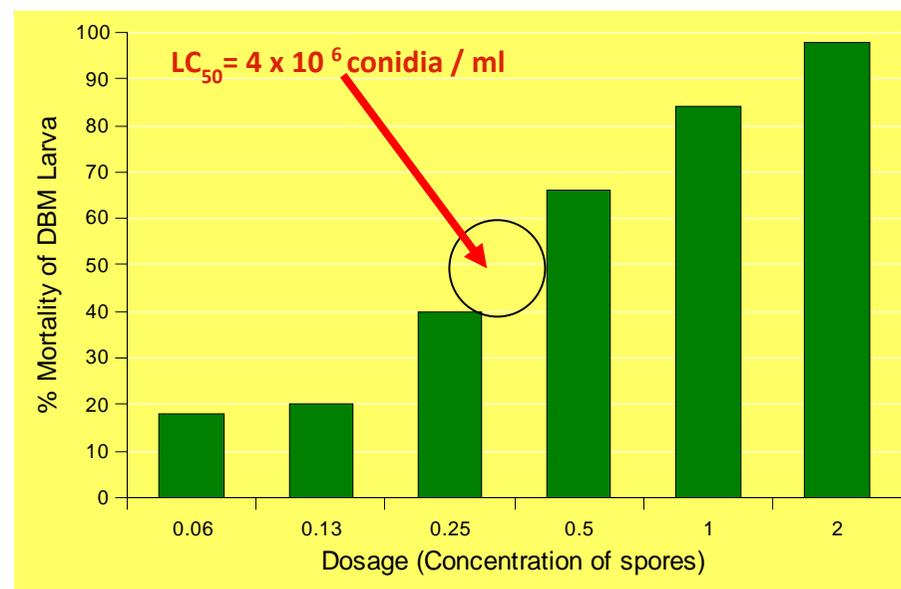
Bio-Efficacy of Myco-Jaal

Lab condition

Mortality of DBM larvae in unformulated and formulated form of conidia



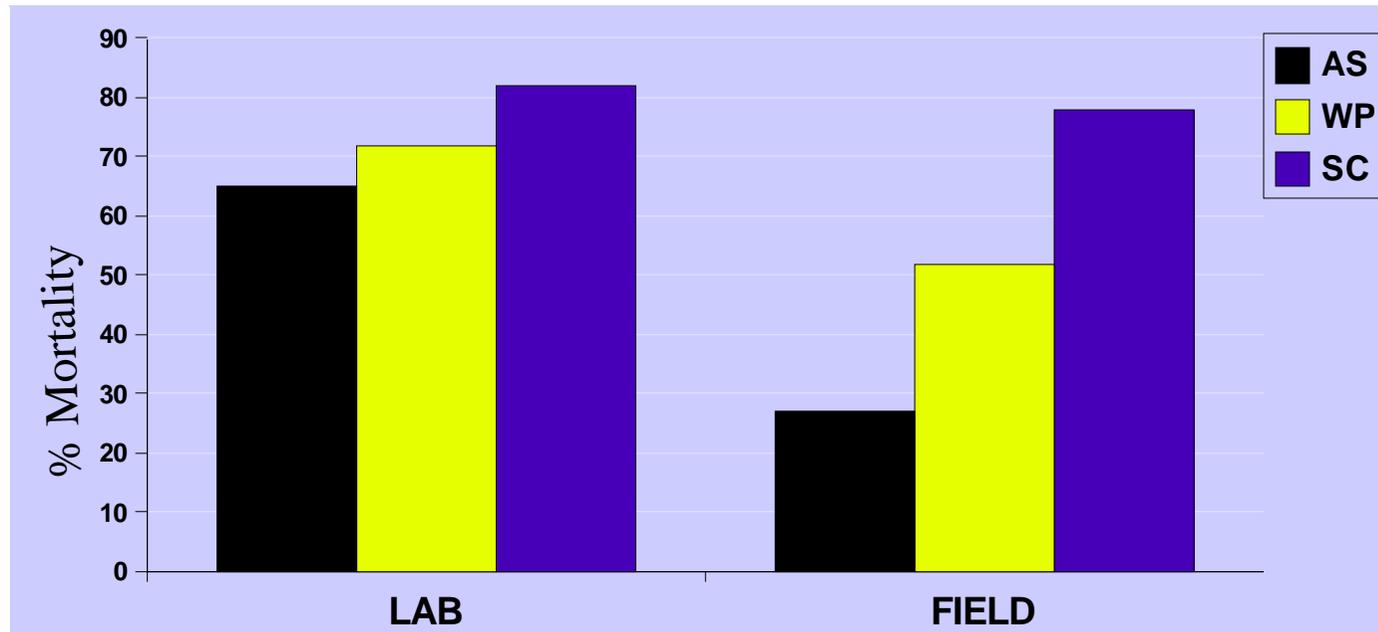
Dose-Mortality Response
(Unformulated form of *B. bassiana*)



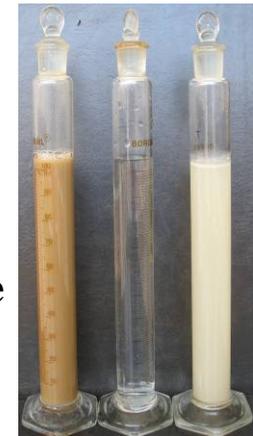
Dose-Mortality Response
(SC- Formulated form of *B. bassiana*)



Comparative efficacy of different formulations

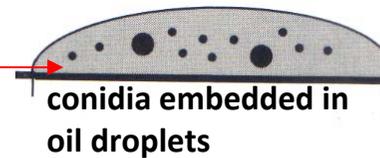
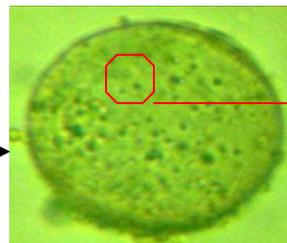
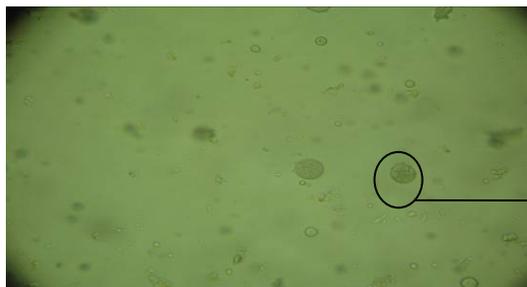
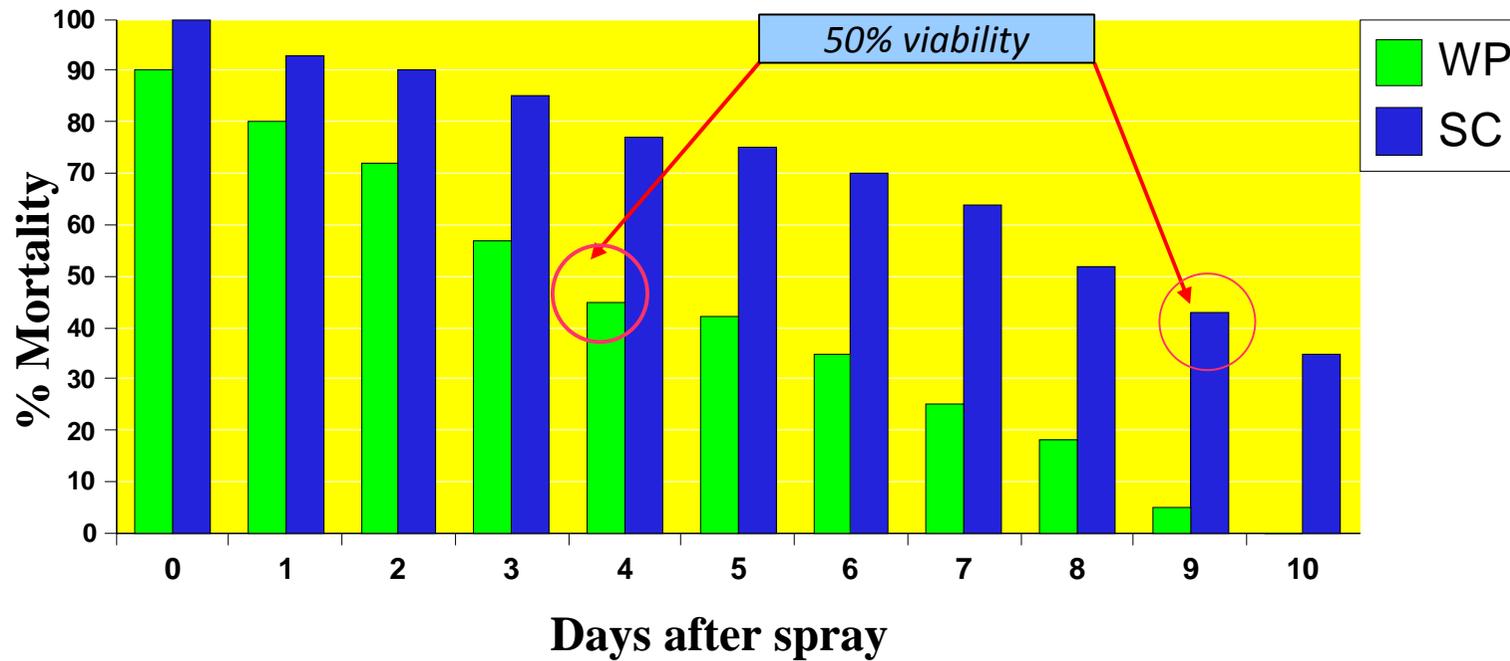


AS- Aqueous Suspension ; WP- Wettable powder; SC- Suspension concentrate





Field Persistence of Myco-Jaal

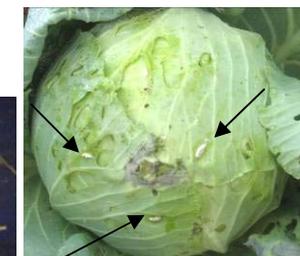




Field Efficacy of Myco-Jaal on Cabbage

Treatments	@	Winter season (2007)			Summer season (2008)		
		DBM population / plant		Yield	DBM Population / Plant		Yield
		0-day	25- DAS	MT/ ha	0-Day	25- DAS	MT /ha
Myco-Jaal	1ml/l	12.05	2.75 ^b	55.79 ^b	6.00	8.75 ^b	38.15 ^b
Myco-Jaal	2ml/l	11.75	1.25 ^a	61.7 ^a	5.25	4.75 ^{ab}	43.13 ^{ab}
Myco-Jaal	3ml/l	11.25	0.75 ^a	66.22 ^a	5.25	3.5 ^a	45.05 ^a
Indoxcarb	0.5ml/l	10.75	0.5 ^a	66.25 ^a	6.75	2.25 ^a	46.83 ^a
BT	1gm/l	11.00	0.75 ^a	60.28 ^{ab}	6.25	3.25 ^a	46.27 ^a
Control		12.75	16.25 ^c	37.15 ^c	6.25	15.5 ^c	29.73 ^c
CD 5%		NS	0.44	6.51	NS	0.75	7.00

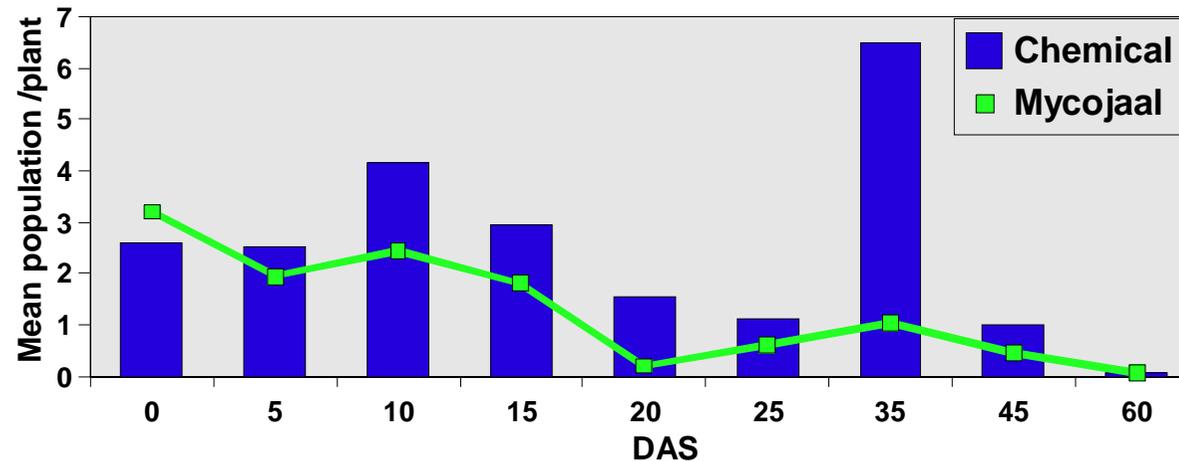
Trial conducted by "Indian Institute of Horticultural Research Institute"(IIHR), Bangalore during Dec'07-March'08.





Cost-Benefit Analysis of Myco-Jaal

Treatments	Application Rate	Population Reduction	Yield	Cost inputs	Additional return	CB ratio
	Liter/ ha		MT/ha	In INR	In INR	
Myco-Jaal	5	58.50%	54.57	2000	10830	5.41
Indoxicarb	1.25	69.08%	54.88	4625	17760	3.84
Myco-Jaal +Indoxicarb	5.63	62.08%	55.76	4812	20400	4.23
Farmers practice	5.31	61.62%	54.5	6279	16360	2.60

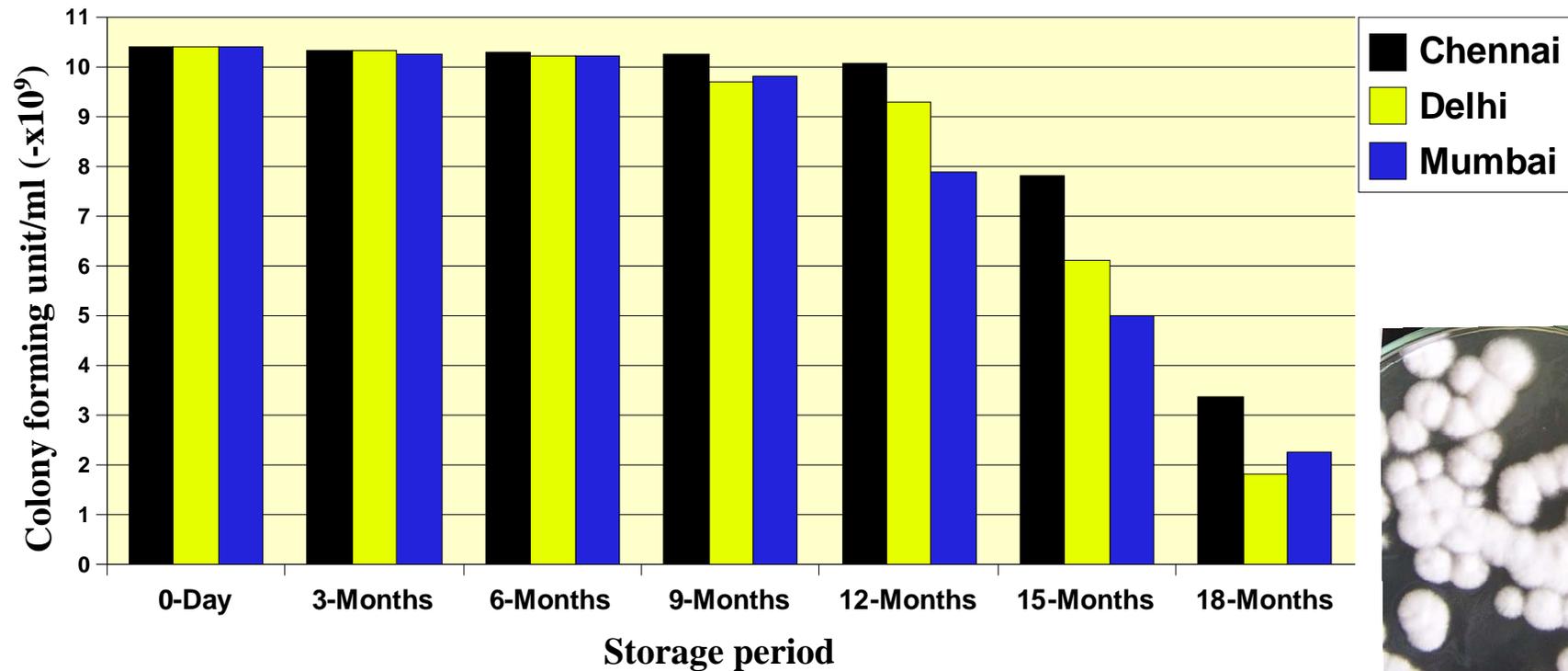


Trend of DBM mortality in Myco-Jaal and Chemicals



Shelf-life of Myco-Jaal

Studies conducted by International Institute of Biotechnology & Toxicology (IIBAT), Chennai, India



• Study period : Jan'07 to July 2008

• Temperature range : 6.5 to 40.6 °C; Relative humidity : 21.0 to 95.0%



Myco-Jaal: Environment Safety

- **Eco-Toxicological studies against vertebrates and invertebrates (Studies conducted by IIBAT, Chennai, India)**
 - Rabbit :Non- toxic and non -virulent (1×10^{10} conidia/ml)
 - Chicken : Non- toxic and non- virulent (1×10^{10} conidia/ml)
 - Fish (*Labeo rohita*) : LC_{50} value > 100 (1.3×10^9 mg/ml)
 - Honey bees (*Apis cerana indica*): LD_{50} value 2390.26 micro gram/bee
 - Earth worm (*Eisenia fetidia*): $LC_{50} > 1000$ mg/kg dry wt.
 - Silkworm (*Bombyx mori*) : Non- toxic even at 1.60% v/v
- **Found to be safe against natural enemies in recommended dosage.**





Advantages of Myco-Jaal

Oil -the ultimate choice

- Myco-Jaal is an Eco-friendly, Safe and Economical Bio-Pesticide.
- The oil based formulation protects the active ingredient from UV radiation.
- Myco-Jaal requires less time to cause infection and has better field efficacy.
- It does not cause development of resistance in insects.





Application of Myco-Jaal

• Method of application

- Shake the container well before opening the cap.
- @ 2ml/ litre of water (5×10^{13} conidia/ha)
- Use 250-300 litre of spray suspension/ acre/application
- Apply 500ml of Myco-jaal /spray/acre using high volume sprayer

• Recommendations

- Apply 3-4 times at weekly intervals
- Irrigate the crop one day before application.
- Myco-jaal is compatible with synthetic chemical insecticides but not fungicides.





Present Status

- **Continuous demonstration and validation led to the increase in**
 - Market demand over 5 times in one year.
 - Production capacity over 10 times by improvisation (Annual production capacity- 20KL)
 - Making technology cost effective for the farmer
- **Globally**
 - Well recognised in news articles in international journals
 - Registration in progress in South -East Asian countries (Indonesia, Malaysia, Thailand) and UAE
 - Look forward for more collaborations in further research
 - Explore possibilities in marketing globally.



New avenues for Myco-Jaal



Aphids



Spider mites



Thrips



White fly



BPH



Rice Hispa



Rice leaf folder



CBB



TMB



Bio-Control Research Laboratories

A division of PEST CONTROL (INDIA) PVT LTD



- ★ Recognized laboratory by DSIR, Govt. Of India
- ★ Operate collaborative projects with national and International Organizations
- ★ Over 25 years in R&D and commercialization of biopesticides and pheromones