



Theme : Crop Protection and Management

**Field evaluation of entomopathogenic fungi against
white grub, *Holotrichia consanguinea* Blanch in
sugarcane.**

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INTRODUCTION

- ❖ White grub, *Holotrichia consanguinea* (Melolonthinae: Scarabaeidae: Coleoptera) – Important soil pest of sugarcane in tropical India.
- ❖ White grub become increasingly difficult pest in Andhra Pradesh during the last few years.
- ❖ Endemic to sugarcane tract in high altitude or assured rainfall areas earlier but extending its spatial range in the recent years due to monoculture of sugarcane and minimal varietal diversity.

Different stages of whitegrub



❖ Duration of first instar grub – 16 days
second instar grub - 32 days and
third instar - 49 days.

❖ Total grub duration ranges from
82 to 113 days.

white grub average duration of one life cycle is 122 days.

❖ White grub **beetles** emerge from soil after early summer showers (May- June).

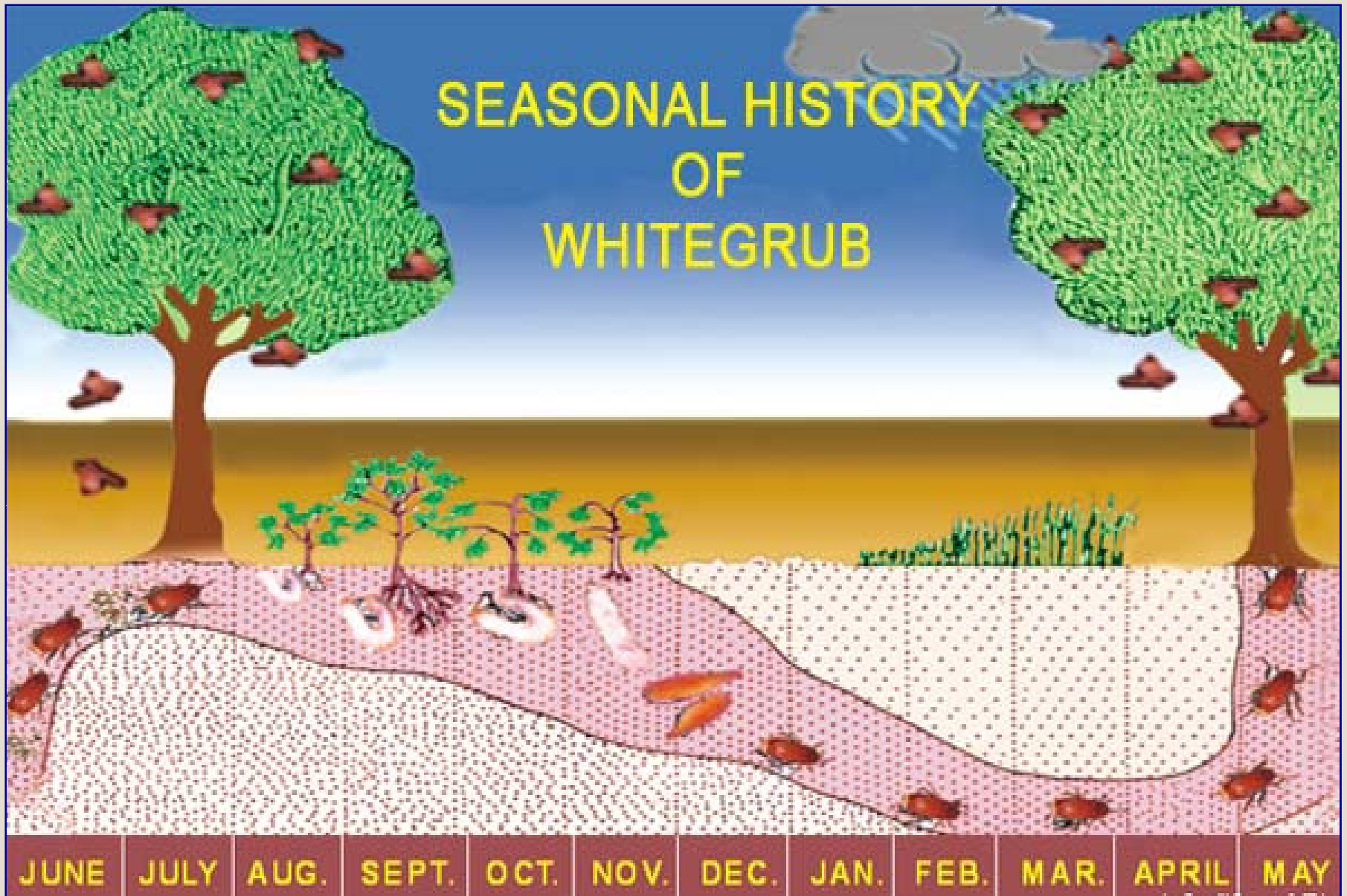
❖ **White grub adults** feed on foliage of host trees like **neem**, acasia .

❖ Average of **20 eggs** are laid by females inside the soil.

❖ Incubation period-
7 to 13 days.

❖ The **newly hatched grubs** feed on **organic matter** till they come in contact with living roots.

SEASONAL HISTORY OF WHITEGRUB



Grubs active feeding period: July to mid October.
Grubs pupate during November.

Symptoms of Damage



❖ **Late larval stages** feed on **roots of sugarcane** and **damage the underground portions of stalks**

❖ **Following injury, spindle wilts and leaves turn yellow; clumps gradually dry up and can be easily pulled out.**

Damage and Loss



- ❖ **Damage** occurs in patches leaving **gaps** .



- ❖ **Severe** cases of **attack** the entire **field** **devastation**.
- ❖ **Affected** canes lose weight, dry up, collapse and become **unfit** for **crushing** and **planting**.

Damage and Loss



- ❖ **Infested clumps harbor 7-10 grown up grubs around the root region.**



- ❖ **Severe symptoms of damage by older grubs manifest only late in the season resulting in complete crop loss .**

Yield loss was as high as 100 per cent.

Management of White grub

- ❖ **Several tactics** have been **adopted** for the management of **white grub** .
- ❖ In a majority of the farming situations, **control** of white grub become **difficult** because of the lack of control over the damage.
- ❖ **Chemical control** is practically **uneconomical**, difficult and associated with high cost, environmental pollution and pesticide residues.
- ❖ Hence, there is need for development of alternate **ecofriendly** and **economically feasible strategy** for the control of **white grub**.

Importance

- ❖ Studies on use of **entomopathogenic fungi** in pest control is **limited**.
- ❖ Among these, ***Beauveria bassiana*** and ***Metarhizium anisopliae*** have great **importance** in the management of **white grub**.
- ❖ Both the fungi are **eco-friendly, cost effective, highly persistent** and also **self-perpetuating** in nature and the microclimate of sugarcane eco-system is ideal for their multiplication.
- ❖ Keeping in view , experiments were conducted to study the efficacy of entomopathogenic fungi for the management of white grub in sugarcane.

Methodology

- ❖ **Field experiments** conducted in endemic areas of farmer's fields i.e., at Pakki village (Bobbilli mandal), **Vizianagaram district, Andhra Pradesh** .
- ❖ **Sugarcane variety 87 A 298** was **planted in July** to study the **efficacy** of treatments imposed **at the time of planting** .
- ❖ **Efficacy** of treatments **at one month after planting** was studied in **June planted crop** .

Treatments: 7

T1 : *Beauveria bassiana* @ 5×10^{13} spores ha⁻¹

T2 : *B. bassiana* in FYM enriched field.

T3 : *Metarhizium anisopliae* @ 5×10^{13} spores ha⁻¹

T4 : *M. anisopliae* in FYM enriched field

T5 : Neem cake @ 500 kg/ha

T6 : Phorate 10G @ 15kg/ha

T7 : Untreated check

Data recorded

- ❖ **Observations were recorded on plant damage due to white grubs , number of white grubs per 10 meter row in the root zone recorded at 60 days after treatment (DAT) i.e.,in Sep-Oct.**
- ❖ **Millable cane, cane yield and sucrose (%) was recorded at harvest.**

RESULTS

- ❖ **Soil Application of Entomopathogenic fungi (*Beauveria bassiana* / *Metarhizium anisopliae* @ 5×10^{13} spores ha⁻¹ (5g/lt) were proved effective in reducing the sugarcane plant damage due to white grubs and also in reducing grub population in both the experiments conducted i.e., Imposing treatments at the time of planting / Imposing treatments at one month after planting compared with phorate and neem cake.**

Treatments imposed at planting

- ❖ ***M. anisopliae*** applied in FYM enriched field proved significantly superior to neem cake , phorate and untreated check.
- ❖ ***M. anisopliae*** reduced the plant damage by grub to the extent of **93.6%** followed by ***B. bassiana*** (**88.09%**) compared to untreated check .
- ❖ ***M. anisopliae*** recorded high grubmortality (**77.22%**) followed by ***B. bassiana*** (**74.08%**).
- ❖ **Phorate** (**45.43%**) and **neem** (**40.93%**) recorded low grub mortality compared to untreated check.

- ❖ **Similar trend was observed in the experiment conducted by imposing treatments at one month after planting i.e., after the onset of monsoon in the month of July.**

Treatments imposed at one month after planting

- ❖ ***M. anisopliae* reduced the plant damage by grub to the extent of 87.89% followed by *B. bassiana* (86.2%) compared to untreated check .**
- ❖ ***M. anisopliae* recorded 76.93% mortality in grubs followed by *B. bassiana* (69.2%) compared to untreated check.**

- ❖ **Highest per cent increase in yield over untreated check was noticed in *M. anisopliae* applied in FYM enriched field in both the experiments i.e., Treatment imposed at the time of planting / at one month after planting.**
- ❖ **Soil application of *M.anisopliae* in FYM enriched field gave higher cane yield in both the experiments.**

Treatments imposed at planting

- ❖ Highest cane yield was recorded in *M. anisopliae* (81.44 t ha⁻¹) in FYM enriched field followed by *B.bassiana* (76.6 t ha⁻¹) .
- ❖ Cane yields recorded less in neem cake, phorate and lowest in untreated check.

Treatments imposed at one month after planting

- ❖ *M. anisopliae* (79.73 t ha⁻¹) in FYM enriched field recorded higher cane yield followed by *B. bassiana* (76.45 t ha⁻¹) in FYM enriched field.

Table 1: Efficacy of entomopathogenic fungi against sugarcane white grub, *Holotrichia consanguinea*.

Treatment	Applied at the time of Planting				Applied at one month after planting			
	White grub damage		White grub population		White grub damage		White grub population	
	Damage (%)	Per cent decrease over untreated check	No. of grubs per 10 m row	Per cent decrease over untreated check	Damage (%)	Per cent decrease over untreated check	No. of grubs per 10 m row	Per cent decrease over untreated check
<i>Beauveria bassiana</i>	4.53	83.13	2.33	68.21	5.15	76.55	2.67	69.2
<i>Beauveria bassiana</i> applied in FYM enriched field	3.2	<u>88.09</u>	1.9	<u>74.08</u>	3.03	<u>86.2</u>	2.67	<u>69.2</u>
<i>Metarhizium anisopliae</i>	3.67	86.34	2.33	68.21	4.52	79.42	2.0	79.93
<i>Metarhizium anisopliae</i> applied in FYM enriched field	1.72	<u>93.6</u>	1.67	<u>77.22</u>	2.66	<u>87.89</u>	2.0	<u>79.93</u>
Neem cake @ 500 kg/ha	9.28	65.45	4.33	40.93	17.19	21.72	6.33	26.99
Phorate 10G @ 15kg/ha	8.41	68.69	4.0	45.43	11.37	48.22	5.67	34.6
Untreated check	26.86		7.33		21.96		8.67	
CD(P=0.05)	4.36		2.09		5.61		2.01	
CV %	9.34		13.9		13.49		16.38	

Table 2 : Efficacy of entomopathogenic fungi on yield parameters of sugarcane.

Treatment	Applied at the time of Planting				Applied at one month after planting			
	Millable canes at harvest (000'ha)	Yield t ha⁻¹	Per cent yield increase over untreated check	Sucrose %	Millable canes at harvest (000'ha)	Yield t ha⁻¹	Per cent yield increase over untreated check	Sucrose %
<i>Beauveria bassiana</i>	83.33	73.77	55.4	19.95	90.33	73.35	15.53	19.5
<i>Beauveria bassiana</i> applied in FYM enriched field	87.3	<u>76.6</u>	61.37	20.04	81.67	<u>76.45</u>	20.43	19.76
<i>Metarhizium anisopliae</i>	94.0	76.55	61.26	18.86	90.33	74.16	16.82	21.15
<i>Metarhizium anisopliae</i> applied in FYM enriched field	92.33	<u>81.44</u>	71.56	19.16	94.67	<u>79.73</u>	25.6	21.89
Neem cake @ 500 kg/ha	94.67	56.95	19.97	16.63	85.33	59.38	-6.46	18.1
Phorate 10G @ 15kg/ha	82.67	65.14	37.22	18.79	80.67	66.77	5.18	17.95
Untreated check	83.67	47.47		16.59	83.0	63.48		17.07
CD(P=0.05)	4.92	5.21		1.24	6.88	14.68		1.73
CV %	3.12	4.48		3.72	4.47	11.25		4.91

Conclusion

- ❖ Soil application of *Metarhizium anisopliae* @ 5×10^{13} spores/ha / *Beauveria bassiana* @ 5×10^{13} spores ha⁻¹ in FYM enriched field was **effective** in reducing the plant damage due to **white grub** and grub population imposing treatment at the time of planting / at one month after planting.
- ❖ As **entomopathogenic fungi** persist in the soil for a **longer** period than chemicals, *Metarhizium anisopliae* and *Beauveria bassiana* are **better alternatives** for the **management of white grubs in endemic areas.**

THANK YOU