

Sukhi Baliraja Initiative
SIR RATAN TATA TRUST

Final Report on

Impact Assessment of Insect Pest Attack and Drought on
Soybean and Cotton Crop in Vidarbha Region of
Maharashtra State

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BOMBAY HOUSE , HOMI MODY STREET, MUMBAI

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Chapter 1 – Introduction

1.1 Introduction

Vidarbha region of Maharashtra is situated in north-eastern part of the state. It has 13 thousand villages spread over 95 thousand square km area with population of 21 million.

Agriculture has been the main source of livelihood in the region. Cotton and Soybean are major crops grown in the region. Cotton and Soybean occupy 38 percent and 20 percent area respectively, whereas pigeon pea is grown in about 8 percent of area. Agriculture is primarily dependent on rainfall and nearly 90 percent of the area is rain fed. The average rainfall in the region is 1000mm to 1200mm.

The region did not receive any rain from mid July to 3rd week of August. As a consequence drought like condition prevailed for 35-40 days. This year (2009) the region received 250-360 mm which was 25-30 percent less than normal. The availability of

ground water for irrigation is limited because of shallow and rocky land. Only 8 percent of land of cultivable area is irrigated through groundwater based resources.. In the recent past the area under cotton crop shrank considerably and it was occupied by soybean crop. The cotton, moong and sorghum crops occupied 10, 50, 85 percent areas, whereas under soybean it was 90, 50, and 15 percent in Wasim, Amravati, Akola and Yavatmal districts respectively.

Both Crops are commonly attacked by American bollworms, tobacco caterpillar and whitefly which are responsible for causing decline in their productivity. The cultivation of moong crop in large areas in the region also added to the severity of attack by foliage feeders (Tobacco Caterpillar and Semilooper and Whitefly). These insect pests need to be managed diligently by following “Integrated Crop Management” (ICM) practices. This implied targeting of pests in their niches through different Integrated Pest Management (IPM) tactics. These techniques are applicable under drought as well as irrigated conditions. Moreover the tactics are easy to use, safe to environment, acceptable to the users and provide good profit.

The study as part of Sukhi Baliraja Initiative (SBI) was undertaken to assess the impact of drought and insect pests in causing the loss to soybean and cotton crop.

1.2 Objectives of Study

- a. To assess the insect pests attack and drought on soybean and cotton crop in Vidarbha region.
- b. To recommend the insect pest management practices for the soybean and cotton crop.

1.3 The Location of Study

The Vidarbha region comprises of 11 districts out of which Yavatmal, Wasim, Amravati and Akola districts were selected. The study was undertaken in Ghatangi, Ralegaon, Kalam, Wasim, Amravati, Akola and Akot blocks of these districts. The region occupies numerous east-west ranges. The region is plateau with steep sides and is elevated between 300 and 600 meters above sea level. In summer temperature rises to 41⁰C to 48⁰C with average rainfall of 850 to 1200mm.

1.4 Methodology

The study was conducted by contacting 200 farmers from 32 villages selected at random from 7 blocks of 4 districts. The observations on effect of drought, insect pest attack, method of management of insect pests, identification of pests and their natural enemies. Information on Spray technology was collected on cotton and soybean crops from 60 randomly selected farmers in the field. NGOs, Dalasa, CSSM, VGSSM, SSP, AHS and NLRDF were contacted to assess their role in pest management. Head of department of entomology, Dr. Panjabrao Deshmukh Krish Vidyapeeth(PDKV), Akola and In-charge Krishi Vigayan Kendra (KVK), Wasim were also contacted to know about recommendation on pest management and drought management on cotton and soybean crops.

Data on the infestation on insect pest was collected from five plants taken from each location. Average figure of their number and percentage of the damage was worked out. The information on application of inputs and use of spray technology was gathered by interviewing the farmers in the field.

1.5 Results

The analysis of data on insect pests attack and observation on effect of drought on soybean and cotton crop revealed following results. Whole Vidarbha region received delayed and less rainfall from June to 4th week of August 2009 (Table1). It delayed sowing of soybean and cotton crops by 15-20 days. The Table shows the average normal rainfall in Vidarbha region and actual rainfall in 4th week of August 2009.

Table 1 : Description of the rainfall in Vidarbha region of Maharashtra

District	Normal rain from May to September (mm)	Rainfall from June to 4th Week of August 2009 (mm)
Akola	700-750	400-450
Amravati	800-900	500-600
Wasim	850-1000	200-250
Yavatmal	800-1200	250-360

The normal period of sowing is from first to second week of June. This year, rains came at end of June to mid of July. Thereafter the region experienced dry spell for 30 to 45 days. Again it received the rain in 3rd week of August. During this period farmers lost the hope of getting good crop of soybean. The traders and banks became reluctant to advance short term loans to farmers fearing that they may not be able to recover it from farmers. This situation had adverse affect in managing insect pests especially on soybean crop.

The farmers were also reluctant to spend money on pesticides to protect the poor crop under long dry spell situation. In absence of insecticide sprays population of leaf feeding insects, i.e., American bollworm, green semilooper etc. increased tremendously. They destroyed the crop in many parts of region.

The drying and burning of soybean crop due to occurrence of dry spell (30-45 days) was not observed at any 60 points of observations. However, the attack of caterpillars on soybean destroyed the crop and the adverse effect of this attack was observed in all districts especially in Yavatmal. In addition, as sowing of cotton crop was delayed; it adversely affected its growth. The plants at some locations were stunted and germination was also sparse. Further, under irrigated conditions both the crops were having normal growth.

Chapter 2 –Insect pests attack on Cotton and Soybean

2.1 Cotton:

Cotton is an important fiber crop. It is attacked by sucking pests and bollworms. When their number crosses the threshold level, it causes loss in field and adversely affects its quality. Therefore, protection of the crop from the pests is primary importance.

The area under cotton is 10, 50, 85 and 50 percent in districts of Wasim, Amravati, Yavatmal and Akola respectively. Cotton in whole of Vidarbha region was under attack of Jassid. As shown in Table 2 to Table 6, Jassid injury was above threshold level in Amravati and Akola districts. It demanded spray of **imidacloprid/acetameprid**. In other districts the injury due to Jassid was below threshold levels and thus cotton crop required no spray as such. Table 2(fig. 1,2 and 3) elucidates the average number of sucking insect

pests and their injury on cotton in different districts of Vidarbha region during 4th week of August 2009.

Table 2: Average number of sucking insect pests and their injury on the Bt-Cotton in different districts of Vidarbha region of Maharashtra during 4th week of August 2009

District	Jassid nymphs/ leaf	Jassid Injury/ grade	Whitefly adults/ leaf	% Plants showing honey dew	%Plants showing attack of	
					Aphid	Thrips
Amravati	2.2	2.0	0.7	0.0	0.0	33.3
Akola	1.7	2.0	0.5	20.0	0.0	34.0
Wasim	0.5	1.4	0.2	0.0	0.0	48.0
Yavatmal	0.6	1.1	0.2	0.0	2.5	62.5

Note: *Jassid Injury Grade Scale 1 to 4. 1 – No symptom of attack; 2-Leaf margin become yellow; 3- Leaf curl become copper brown; 4-Copper brown leaf dries becomes brittle and fall*

Whitefly damage was not observed in whole of Vidarbha region. Number of Whitefly adults and plants showing honey dew were far below the threshold levels. (Threshold: 50 percent of plants showing honey dew per 6 adults Whiteflies per leaf). The attack of aphids and thrips was negligible.

Figure 1 : Showing the average number of Whitefly adults per leaf in Vidarbha region

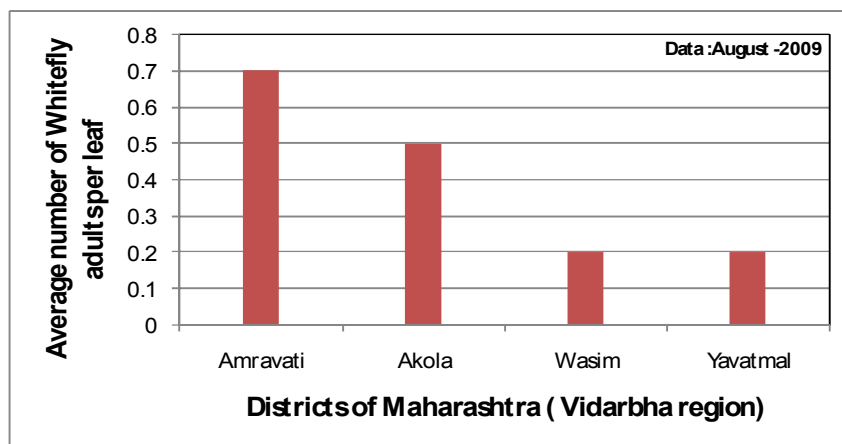


Figure 2 : Showing the average number of Jassid nymphs per leaf in Vidarbha region

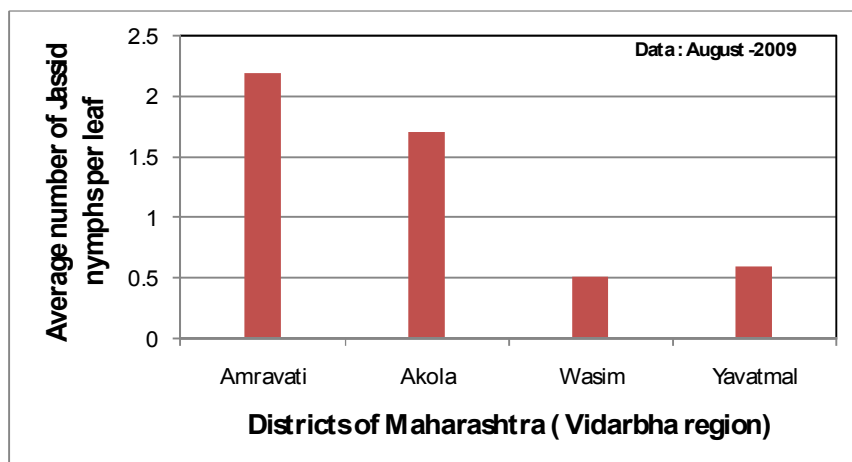
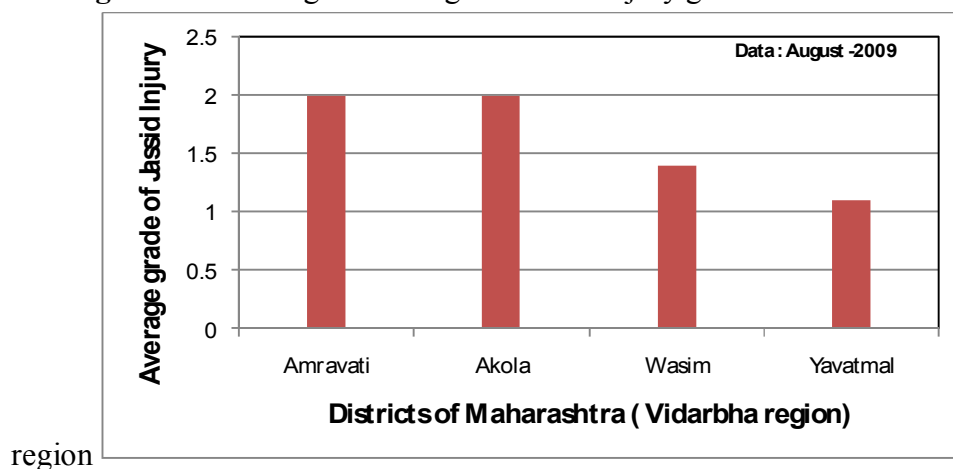


Figure 3 : Showing the average of Jassid injury grade in Vidarbha



region

The number of sucking insects and injury levels inferred that only 1-2 sprays of insecticides were needed against Jassid only. The farmers revealed that they have given 3-4 sprays of insecticides or their mixture for the management of Jassid. Further, farmers did spray against whitefly though it was not required.

Table 3 : Average number of sucking insect pests and their injury on the Bt-Cotton in Amravati district of Vidarbha region of Maharashtra during 4th week of August 2009

Amravati (Taluka)	Jassid nymphs/ leaf	Jassid Injrury/ grade	Whitefly adults/ leaf	% Plants showing honey dew	%Plants showing attack of	
					Aphid	Thrips
Sundurjana	1.4	2.0	0.4	0.0	0.0	40.0
Wathoda1	4.8	2.0	0.2	0.0	0.0	40.0
Wathoda2	0.4	2.0	1.6	0.0	0.0	20.0

Table 4: Average number of sucking insect pests and their injury on the Bt-Cotton in Akola district of Vidarbha region of Maharashtra during 4th week of August 2009

Akola (Taluka)	Jassid nymphs/ leaf	Jassid Injrury/ grade	Whitefly adults/ leaf	% Plants showing honey	%Plants showing attack of	
					Aphid	Thrips
Adagaon	0.2	2.0	0.0	0.0	0.0	20.0
Apathapa	0.4	2.0	0.4	0.0	0.0	40.0
Akhatwara	2.1	2.0	0.1	0.0	0.0	20.0
Chohata	3.2	2.0	0.4	0.0	0.0	20.0
Dhahori	2.4	2.0	0.2	0.0	0.0	20.0
Lakhanpur	2.2	2.0	1.4	20.0	0.0	20.0
Lakhegaon	1.2	2.0	0.0	0.0	0.0	20.0
Khobarkar	2.0	2.0	0.0	1.0	0.0	80.0
Ghusarwadi	0.8	2.0	1.2	2.0	0.0	20.0
Majori	3.4	2.0	0.8	3.0	0.0	80.0

Table 5 : Average number of sucking insect pests and their injury on the Bt-Cotton in Wasim district of Vidarbha region of Maharashtra during 4th week of August 2009

Wasim (Taluka)	Jassid nymphs/ leaf	Jassid Injrury/ grade	Whitefly adults/ leaf	% Plants showing honey dew	%Plants showing attack of	
					Aphid	Thrips
Akhburji	0.2	1.0	0.4	0.0	0.0	40.0
Babulgaon	0.4	2.0	0.2	0.0	0.0	40.0
Kata	0.4	2.0	0.2	0.0	0.0	40.0
Tamsala	0.6	1.0	0.2	0.0	0.0	60.0

Table 6 : Average number of sucking insect pests and their injury on the Bt-Cotton in Yavatmal district of Vidarbha region of Maharashtra during 4th week of August 2009

Yavatmal	Jassid nymphs/ leaf	Jassid Injrury/ grade	Whitefly adults/ leaf	% Plants showing honey dew	%Plants showing attack of	
					Aphid	Thrips
Ghatangi (Taluka)						
Jarur	0.6	1.0	0.2	0.0	0.0	60.0
Mawade	0.4	2.0	0.2	0.0	20.0	80.0
Kalam (Taluka)						
Wadegaon	0.2	1.0	0.0	0.0	0.0	40.0
Ralegaon (Taluka)						
Bhimsenpur	1.0	2.0	0.4	0.0	0.0	80.0
Dapori	0.4	1.0	0.2	0.0	0.0	40.0
Khemkund	0.8	1.0	0.2	0.0	0.0	80.0
Sabarkhera	0.8	2.0	0.6	0.0	0.0	80.0
Kalam (Taluka)						
Wadegaon	0.2	1.0	0.0	0.0	0.0	40.0

2.2 Soybean:

Soybean is high value crop. This crop thrives well in the region because of its fertile and well drained soils. Wasim, Amravati, Yavatmal and Akola districts occupy 90, 50, 15 and 50 percent area under soybean respectively. This crop was attacked by American Bollworm, tobacco caterpillar, semilooper, hairy caterpillar and girdle beetle. Out of all these insects, attack of semilooper was severe.

The average number of semilooper varied from 0.4 to 3.8 per meter row length (table 7). Its severe attack was observed in Yavatmal followed by Wasim, Amravati and Akola. It devastated the crop in June- July by feeding on leaves. Moderate to heavy attack of tobacco caterpillar and American-bollworm was also observed in all soybean growing areas (table 8,9,10 and 11). These caterpillars fed on leaves of soybean. The attack of girdle beetle was seen only in Wasim district. Its average number varied from 0.1 to 0.6 per meter row length (table 10).

Table 7 : Attack of different Lapidopterous Caterpillar and Girdle Beetle Grubs on Soybean in different districts of Vidarbha region of Maharashtra during August 2009

District	Average per meter row length				
	Americian Ballworm	Tobacco Caterpillar	Semilooper	Hairy Caterpillar	Girdle Beetle Grubs
Akola	0.3	0.1	0.4	0.0	0.0
Amravati	0.1	0.4	0.8	0.1	0.0
Wasim	1.8	0.8	1.4	0.3	0.3
Yavatmal	0.8	0.3	3.8	0.1	0.0

Table 8 : Attack of different Lapidopterous Caterpillar and Girdle Beetle Grubs on Soybean in Amravati districts of Vidarbha region of Maharashtra during August 2009

Amravati	Average per meter row length				
	Americian Ballworm	Tobacco Caterpillar	Semilooper	Hairy Caterpillar	Girdle Beetle Grubs
Teosa (Taluka)					
Sundurjana	0.4	0.6	1.8	0.4	0.0
Wathoda	0.0	0.4	0.0	0.0	0.0
Wathoda	0.0	0.4	0.8	0.0	0.0
Average	0.2	0.5	0.9	0.2	0.0
Amravati (Taluka)					
Boregaon	0.0	0.6	2.1	0.0	0.0
Dilora	0.0	1.2	1.0	0.0	0.0
Dilora	0.6	0.0	0.0	0.1	0.0
Average	0.2	0.6	1.0	0.0	0.0
Murtizapur (Taluka)					
Khrab	0.0	0.2	0.6	0.1	0.0
Average	0.0	0.2	0.6	0.1	0.0

Table 9 : Attack of different Lapidopterous Caterpillar and Girdle Beetle Grubs on Soybean in Akola districts of Vidarbha region of Maharashtra during 4th week of August 2009

Akola	Average per meter row length				
	Americian Ballworm	Tobacco Caterpillar	Semilooper	Hairy Caterpillar	Girdle Beetle Grubs
Lakhanpur	1.2	0.4	1.9	0.0	0.0
Majori	0.2	0.0	0.2	0.0	0.0
Apathapa	0.0	0.0	0.1	0.0	0.0
Akhtawara	0.0	0.0	0.4	0.0	0.0
Ghusarwadi	0.4	0.0	0.0	0.0	0.0
Chohata	0.0	0.0	0.0	0.0	0.0
Adagaon1	0.0	0.2	4.0	0.0	0.0
Adagaon2	0.0	0.2	0.0	0.0	0.0
Average	0.2	0.1	0.8	0.0	0.0

Table 10 : Attack of different Lapidopterous Caterpillar and Girdle Beetle Grubs on Soybean in Wasim districts of Vidarbha region of Maharashtra during August 2009

Wasim	Average per meter row length				
	American Ballworm	Tobacco Caterpillar	Semilooper	Hairy Caterpillar	Girdle Beetle Grubs
Wasim	0.8	0.8	4.0	0.2	0.6
Wasim	5.0	0.2	1.2	0.0	0.1
Tamsala	1.6	0.2	1.8	1.2	0.6
Akburji	0.4	1.6	0.8	0.2	0.6
Babulgaon	1.2	1.2	0.2	0.0	0.2
Kata	1.5	0.5	0.7	0.0	0.2
Average	1.8	0.8	1.5	0.3	0.4

Table 11 : Attack of different Lapidopterous Caterpillar and Girdle Beetle Grubs on Soybean in Yavatmal districts of Vidarbha region of Maharashtra during August 2009

Yavatmal	Average per meter row length				
	American Ballworm	Tobacco Caterpillar	Semilooper	Hairy Caterpillar	Girdle Beetle Grubs
Ghatangi (Taluka)					
Jarur	0.0	0.2	5.4	0.2	0.0
Jarur	0.0	0.6	6.0	0.0	0.0
Average	0.0	0.4	5.7	0.1	0.0
Kalam (Taluka)					
Wadegaon	0.2	0.0	8.0	0.0	0.0
Wadegaon	0.0	0.2	4.0	0.2	0.0
Anila	0.4	0.0	4.8	0.0	0.0
Average	0.2	0.1	5.6	0.1	0.0
Ralegaon (Taluka)					
Natkhed	0.0	0.0	9.4	0.0	0.0
Dapori	0.2	0.2	6.0	0.2	0.0
Dapori	0.8	0.2	4.4	0.2	0.0
Kalmaner	0.0	0.0	7.2	0.0	0.0
Kalmaner	3.4	2.1	5.6	0.0	0.0
Average	0.9	0.5	6.5	0.1	0.0

Chapter 3 – Insect Pests Management Tactics adopted by farmers for Soybean and Cotton Crop

3.1 Cotton:

The cotton was at fruiting phase. The cotton plant on an average bore 20 to 34.5 fruiting bodies per plant (table 12). Bt-cotton does not provide effective control of sucking pests and tobacco caterpillar. Among the sucking pests Jassid and Whitefly are major pests causing damage to crop by sucking sap from leaves. In addition, Whitefly also transmits cotton leaf curl viral disease.

Table 12 : Average number of fruiting bodies on Cotton in different districts of Vidarbha region on during 4th week of August 2009

District	Flowers and Flower buds per plant
Amravati	20
Akola	25.7
Yavatmal	34.5
Average	26.7

Observations recorded from 8 villages of yavatmal, 2 villages from Amravati and 9 villages of Akola districts ;
Average of 5 plants at each location

Tobacco caterpillar, being polyphagous pest causes serious damage to cotton from July-October. Spotted and Pink bollworm and American bollworm do not damage Bt-cotton. Farmers are managing these insects with insecticide sprays.

3.1 a) Monitoring of Pests:

The monitoring of bollworms is to be performed at a flower initiation stage. This strategy helps in making decisions for effective management of bollworms especially tobacco

caterpillar in Bt-cotton. The farmers in the region did not adopt any such strategy for managing tobacco caterpillar which is major pest. Decisions regarding spray of insecticides based on Economic Threshold (ETH) for initiating insecticidal sprays for managing tobacco caterpillar and sucking pests were not adhered. Less than one percent of farmers were aware of ETH values of pests (table 13).

Table 13 : Decision making capacity of farmers for initiating sprays against insect pests on cotton*

Item	Percent Farmers	
	Aware	Not Aware
Identification of Pests	29	71
Selection of right pesticides based on pest identification	12	88
Selection of right dose of insecticide	7	93
Right time of spray	43	57
Quality of insecticide	27	73
Economic threshold values	<1	99

* Information collected from 120 farmers

The farmers did not have desired ability to identify pests, select right insecticides, right dose etc. They did not spray chemicals recommended by Agricultural University (table 15). They normally selected wrong insecticides and sprayed them at under dosages at wrong time. Large number of growers sprayed mixtures of insecticide, mixtures of insecticide and fungicides, mixtures of insecticide + fungicides+ fertilizers (Table 16)

3.1 b) Spray Technology:

The insecticides recommended by PDKV, Akola for control of pests should be sprayed with knapsack sprayer fitted with triple action hollow cone nozzle using 200 liters of water. Few farmers (13 percent) were aware about this technique. Four percent of farmers knew about use of flat fan nozzle for spraying weedicides and 13 percent had knowledge of hollowcone nozzle which is recommended for insecticide spray in cotton. Similarly, 7

percent farmers were aware about Package of Practices recommended for growing cotton crop by PDKV, Akola as shown in Table 14.

Table 14 : Knowledge of spray technology supplied by 80 farmers (given in percentage)

Do you Know	Yes	No
a) Type of nozzle used for insecticidal spray	13	87
b) Type of nozzle used for weed control	4	96
c) Practices recommended for pest control by Dr. PDKV, Akola	7	93

Table 15 : Insecticides recommended for spray against pests by DR PDKV, Akola

Insecticides recommended for spray against pests		
Insect	Insecticide	Dose (ml) Acre
Jassid, Thrips, Mite, Aphid	Dimethoate	200
	Methyl Demeton	160
	Acetameprid	30
Whitefly	Monocrotophos	560
	Dimethoate	660
	Triazophos	200
Mealy-bug	Acephate	600
	Chlorpyriphos	600
	Profenophos	400
	Triazophos	400
Bollworm	HANPV	250 l/hectare
	NSE	5%
	Spinosad	40

	b-Cyfluthrin	200
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Table 16 : Some of Insecticides Sprayed by Farmers on the Cotton Crop

Insecticides sprayed by farmers on cotton crop.		
Description	Insecticides	Dose (ml)/ acre
Sucking Pests, Tobacco Caterpillar	Chlorpyriphos	1500;400
	Dimethoate	100;200
	Chlorpyriphos + Karate+Leosime	500+100+200
	Neem seed kernel	25 Kg
	Neem Leaves + Quinalphos + DAP / Urea	700+700+500
	Ekalux	300
	Cypermethrin	300
	Triazophos	500
	Profenophos	380
	Profenophos Acephate	380+400
	Phosalone	600
	Carbaryl	600
	Acetameprid	20
	Imidacloprid	100

3.1 c) Bollworms:

The whole of Vidarbha region grows Bt-cotton hybrids. The area under non Bt-cotton was negligible. Therefore, the attack of bollworms especially of spotted and pink bollworm was not observed on cotton crop. At few locations the tobacco caterpillar and American bollworm were observed feeding on leaves and fruiting bodies (table 17-21). It might be due to fact that the farmers grow soybean and moong along with cotton. Akola and Wasim districts have 50 to 90 percent under soybean. Amravati and Yavatmal have 50 and 15 percent respectively. Both of these crops are attacked by American bollworm and tobacco caterpillar. The attack of these insects shifts from these crops to cotton.

Table 17 : Average number of bollworms on cotton in different district of Vidarbha region of Maharashtra during 4th week of August 2009

Description	Average per Plant	
	Tobacco Caterpillaar	American Ballworm
Amravati	0.2	0.0
Akola	0.5	0.5
Wasim	0.4	0.0
Yavatmal	0.2	0.1
Grand Average	0.3	0.2

Table 18 : Average number of bollworms on cotton in Yavatmal district of Vidarbha region of Maharashtra during 4th week of August 2009

Yavatmal	Average per Plant	
	Tobacco Caterpillaar	American Ballworm
Ghatangi (Taluka)		
Jarur	0.2	0.0
Mowade	0.2	0.0
Kalam (Taluka)		
Wadegaon	0.2	0.3
Ralegaon (Taluka)		
Bhemsenpur	0.0	0.0
Khemkund	0.0	0.1
Sabarkhera	0.8	0.1
Yavatmal		
Yarad	0.2	0.0
Grand Average	0.2	0.1

Table 19 : Average number of bollworms on cotton in Wasim district of Vidarbha region of Maharashtra during August 2009

Wasim	Average per Plant	
	Tobacco Caterpillaar	American Ballworm
Wasim (Taluka)		
Wasim	0.6	0.1
Tamsala	0.2	0.0
Akhburji	0.0	0.0
Babulgaon	0.2	0.0
Kota	0.8	0.0
Grand Average	0.4	0.0

Table 20 : Average number of bollworms on cotton in Akola district of Vidarbha region of Maharashtra during August 2009

Akola	Average per Plant	
	Tobacco Caterpillar	American Ballworm
Akola (Taluka)		
Majori	1.5	3.0
Ghusarwadi	0.5	0.4
Khobarkher	1.2	0.0
Apathapa	0.0	0.0
Akhatwara	0.2	0.0
Adgaon	0.0	0.0
Dahori	0.3	0.0
Grand Average	0.5	0.5

Table 21 : Average number of bollworms on cotton in Amravati district of Vidarbha region of Maharashtra during August 2009

Amravati	Average per Plant		
	Tobacco Caterpillar	American Ballworm	Girdle Beetle Grubs
Teosa (Taluka)			
Sundarjano	0.4	0.0	0.0
Wathoda	0.0	0.0	0.0
Grand Average	0.2	0.0	0.0

Throughout the region attack of bollworm was far below economic threshold level (5 percent damage in freshly shed fruiting bodies). It is due to this reason that Bt-cotton is cultivated over large area. Thus, sprays against bollworms were not required. Interaction with farmers revealed that they have given 1 to 2 prophylactic sprays of insecticides against bollworms.

3.2 Soybean:

Soybean Crop like cotton is sprayed with un-recommended mixtures of insecticides at un-recommended dosages for the management of Tobacco caterpillar, American bollworm, semilooper and hairy caterpillar (Table 22).

Table 22 : Insecticides sprayed on soybean for control of lepidopterous caterpillar during 4th week of August

Insecticides	Dose ml/acre
Monocrotophos + Endosulfan	500 + 500 ; 250 + 250
Endosulfan + Dimethoate Quinalphos	500 + 500
Quinalphos + Endosulfan	100 + 250
Dimethoate	500 ; 250
Monocrotophos +Sulphur	250 + 250
Chlorpyriphos	500
Chlorpyriphos + Karate	500 + 100
Neem seed kernel Extract	1500
Neem Leaves	25 Kg
Quinalphos + Neemicide	400 + 500
Triazophos	250
Methomyl	250
Cypermethrin + Acephate	300 + 250 g
Profenophos	380
Chlorpyriphos + Cypermethrin	250 + 250

Farmers sprayed these insecticides by using 60 to 80 liters of water per acre. This amount of water was insufficient to provide good coverage of insecticides on the foliage. It gives poor control of pests and add to the increase in cost of sprays.

The attack of girdle beetle was localized and was observed in Wasim district. Its grubs bore into stem and twig as a result the plants initially wilt and then die. The affected plant bears less number of pods. Thus it affects the yield adversely. The farmers are

managing the pest by ploughing the field deep by not intercropping sorghum or maize in soybean crop. Spray of Quinalphos or Cypermethrin is given to kill the grubs. However, these insecticides do not seem to be effective against the beetle.

During normal years of rainfall (End May to June), farmers give fewer sprays for managing semilooper and tobacco caterpillar. During 2009 the attack of American bollworm was exceptionally high in Wasim. In Yavatmal attack of semilooper was severe. In other districts all the caterpillars attacked the crop. The farmers were caught unaware and they did not spray against these pests in time and suffered high loss of crop. It happened because of the fact the crop growth became poor due to late occurrence of rain. Dry spell of 40-45 days (July to August) further aggravated the problem.

Chapter 4 – Transfer of Technology

PDKV Akola has developed plant protection technology for cotton and soybean. This technology is not transferred to the farmers properly by government and non-government agencies. Six NGOs working in four districts of Vidarbha (Table 23) give their own recommendations. Officials of department of agriculture posted at district and taluka level have less contact with farmers. Therefore farmers depend upon the pesticide dealers and commission agents (Krishi Kendra) for advice on protection of cotton and soybean crop against pests. Thus there is need to evolve effective technology for pest management. It may be achieved by increasing the coordination between research and extension agencies. The official of NGOs especially Krishi Mitras may be given adequate training in IPM by agricultural university, KVKs or by State department of agriculture.

Table 23 : List of NGOs working in different districts of Vidarbha region of Maharashtra

NGOS working in 4 districts of Vidarbha region	
NGO	Location
Dilasa	Yavatmal
Vikas Ganga	Yavatmal
Chetna Samaj Sewa Mandal	Yavatmal/Nasik
Swayam Shiksham Paryog	Wasim
Apeksha Home Society	Amravati

4.1 Recommendations:

- Farmers were advised to follow plant protection technology evolved by PDKV Akola for managing pests on cotton and soybean.

- Spray of mixture of insecticides or at under dose be avoided.
- Spray dimethoate, acetameprid, imidacloprid at recommended doses for Jassid aphid and thrips control on cotton.
- Use triazophos for managing whitefly on cotton and soybean.
- Spray chlorpyrifos, acephate, and endosulfan against lepidopterous insects on cotton and soybean.
- Wherever irrigation facilities are available, cotton crop must be irrigated at fruiting phase.
- Application of DAP fertilizer by broadcasting should not be performed.
- Officials of NGOs engaged in agrarian activities in *kharif* season should be properly trained in insect pest management technology.
- Training of village level workers (Krishi Mitras) in IPM technology must be arranged at KVKs or in an Agricultural university.

4.2 Summary:

- We Visited 32 villages in 4 districts of Vidarbha region of the Maharashtra and contacted around 200 farmers at 60 field sites. This is performed to access the impact of drought and pest attack on cotton and soybean crop.
- The region experienced a dry spell of around 35-40 days during 2nd week of July to 3rd week of August. No evidence of crop failure was observed due to occurrence of drought.
- Soybean crop has failed in some area of Yavatmal and Wasim due to high pest attack and negligence of the farmers to overcome drought conditions.

- The farmers did not conduct any surveillance of insect pests on soybean during dry spell. The farmers became negligent about the crop by presuming that dry spell may extend for longer period. In this regard, they got notion that crop will die due to long dry spell and thus there will be no use of protecting it from pests.
- Scanty and late rainfall during May and June delayed the sowing of cotton and soybean by 10-15 days. Delayed sowing resulted in stunted growth of cotton crop and lesser bearing of fruiting bodies up to 4th week of August. The soybean crop bore pod late, which will eventually delay the maturity of the crop.
- Sucking pests such as Jassid was serious on cotton in whole of the region. Whitefly population was below economic threshold level (ETH) and attack of tobacco caterpillar was very less on cotton.
- On soybean the attack of semilooper, tobacco caterpillar and American bollworm was severe.
- Farmers were unaware about the recommended pest management techniques available for controlling the pests on both the crops. They are spraying insecticides/ mixture at un-recommended dosages
- After the interaction with farmers, NGOs and agricultural specialists, it was noticed that extension services available for transferring technology from laboratory to land was inadequate.
- Due to occurrence of late rain and prevalence of dry spell the loss of 10-20 percent in yield of cotton is expected and while in soybean, the loss of yield may be from 10-30 percent.

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