



Stale seed bed technique and leguminous cover crops as tools in integrated weed management of irrigated cotton of southern India

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Indian Cotton Scenario – Past, Present and future

- ➡ India is the only country in the world growing cotton of all staples
- ➡ We are World No.2 in Production (351 lakh bales)
- ➡ But our productivity is very less (526 kg/ha)
- ➡ We have achieved 12.5 fold enhancement from 28 lakh bales in 1947- 48 to 351 lakhs bales in 2016-17
- ➡ Our demand is 475 lakhs bales in 2020 and we can achieve this by adoption of improved crop cultivars and production technologies



Weeds of cotton

- ✿ About **100** weed species were reported as associated with cotton
- ✿ only a **dozen** of them are responsible for significant yield losses.



Weed management in cotton



- ✿ First 60 DAS more critical
- ✿ Up to 85 % yield reduction was reported
- ✿ Cultural, mechanical and chemical methods
- ✿ Chemical control – predominant - globally

Worldwide, herbicides outrank insecticides and fungicides

- ✿ Present recommendation of pre emergence herbicide (pendimethalin) application followed by two or three inter cultivation is a common practice in INDIA
- ✿ However, providing timely weed control may not be possible as inter-row cultivation is weather dependent,



Herbicidal weed management

- Pendimethalin, metolachlor, fluometuron,, as pre emergence spray.
- For post emergence application, fluazifop butyl, quizalofop ethyl, fenoxoprop (for grasses)
- Pyrithiobac sodium can be applied as pre and post emergence
- Pendimethalin – HW – mixture of pyrithiobac + Quizalofop/fenoxoprop (Nalayini et al., 2012)



Benefits and concern of **HTGM** crops in chemical weed management

- Encourage the farmers to go for reduced or no tillage cultivation
- Flexibility in application
- Eliminate the use of some of the environmentally suspect herbicides
- Lesser cost of weed control
- Lesser herbicide carryover problems

Major concern : Escape of Transgenes and development of super weeds

Concern with HTGM ...

- Gene flow from herbicide resistant crops to wild or semidomesticated relatives can lead to the creation of **superweeds**

The weed relatives of Cotton are

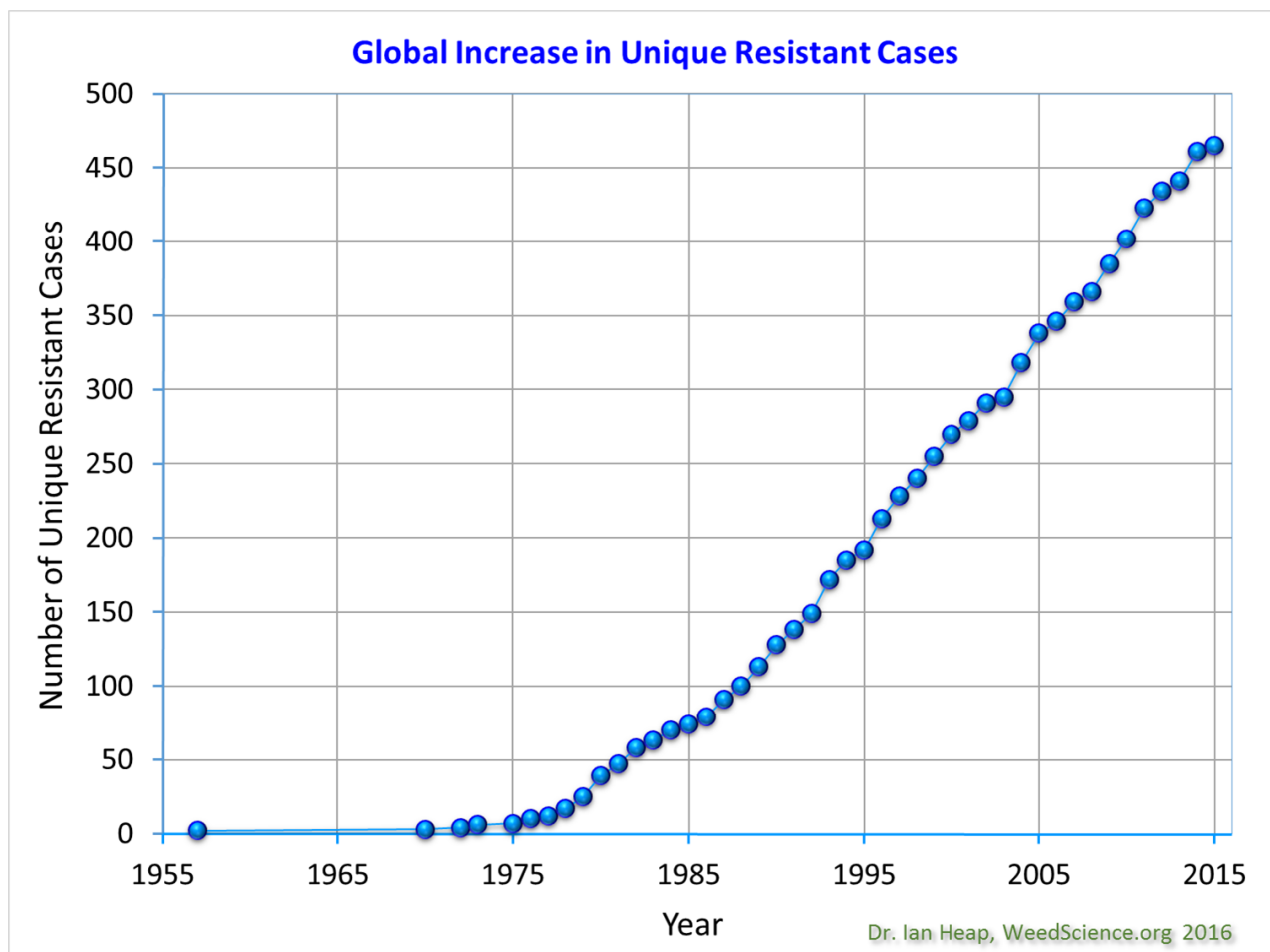
- *Gossypium tomentosum* (Hawaii)
Gossypium stocksii (India)

Cotton, Hoke County, North Carolina

Glyphosate-resistant Palmer amaranth

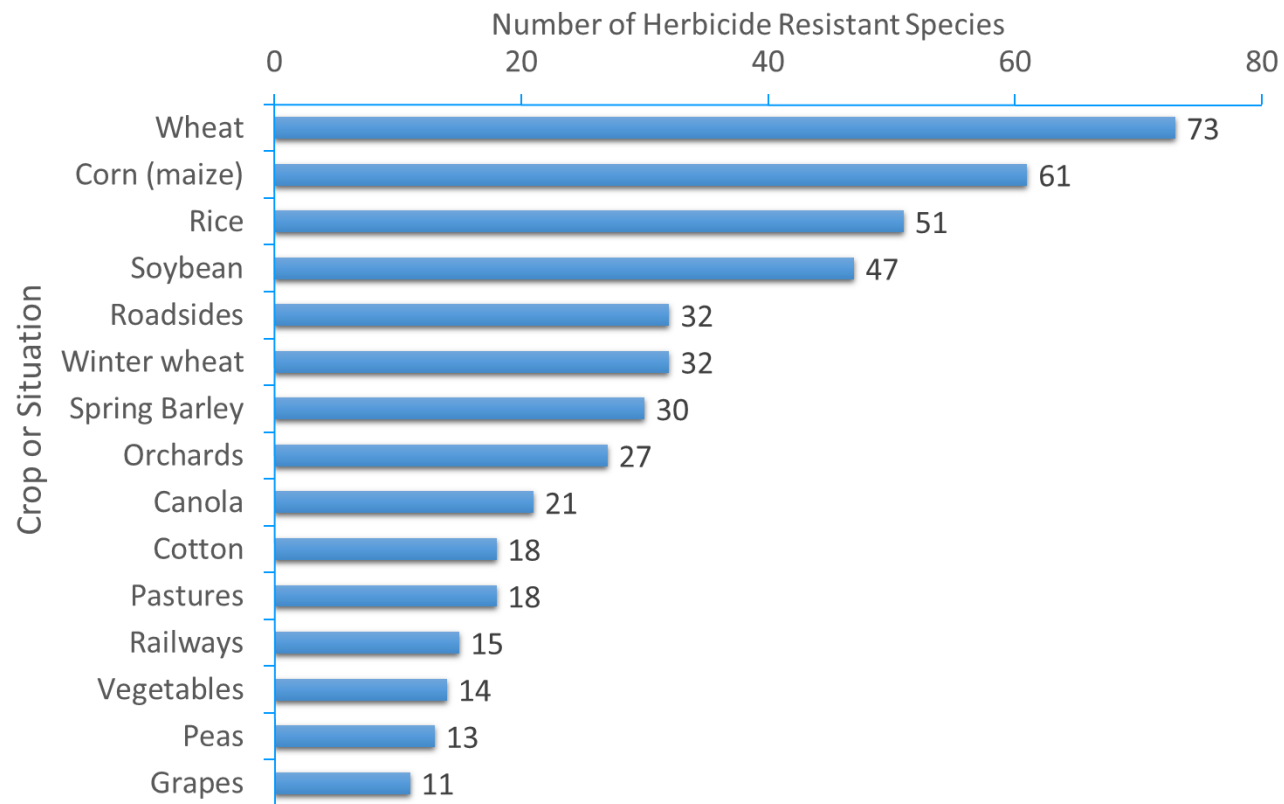


Courtesy : Cotton Incorporated



AS on today, **482** unique cases of HR weeds (**146 dicots** and **106 monocots**) have evolved resistance.

Number of Herbicide-Resistant Species by Crop



Significance of IWM

- **Over reliance on fewer weed management strategy will result in evolution of herbicide resistance to the useful herbicides**
- **Once weeds develop resistance, replacement of herbicides is the only option in such a scenario.**

To preserve the utility of herbicides in agriculture ...

Active resistant management is essential. Which could be achieved through

- ◆ **Herbicide rotation**
- ◆ Mixing herbicides with different mode of action
- ◆ Combining nonchemical methods like solarization, mulching etc .,
- ◆ Stale seed bed method
- ◆ **Mechanical removal**
- ◆ Growing compatible intercrops
- ◆ Combination of all the above where ever possible

Objectives

- To **exhaust weed seed bank** before cotton sowing by stale seed bed technique
- To **smother weeds** by leguminous cover crops
- To integrate **SSBT and leguminous cover crops** as tools in IWM of Irrigated cotton and
- To standardize **sustainable weed management** package for irrigated cotton production system

What is stale seed bed technique ?

- Preparing land one month in advance of cotton sowing and irrigating to induce weed seeds to germinate **and targeting them after two weeks with pendimethalin + glyphosate each 1.0 kg/ha** and sowing of cotton after two weeks of spraying is an efficient technique to exhaust weed seed bank and thereby reducing the weed pressure during actual cotton growth.

Treatments

Design : RBD

Replication : 4

1. SSBT followed by Thornless mimosa (*Mimosa invisa*) + 1 Hw
2. SSBT followed by Sun hemp (*Crotalaria juncea*) 1Hw
3. SSBT followed by Daincha (*Sesbania aculeata*) + 1Hw
4. SSBT followed by Forage Cowpea (*Vigna unguiculata*)+ 1Hw
5. SSBT followed by Desmanthus (*Desmanthus virgatus*)+ 1 Hw
6. No SSBT (pendimethalin 1.0 kg ai as Pre emergence)+ Hw (twice)

Exhausting weed seed bank under Stale seed bed technique



SSBT *Vigna unguiculata* as cover crop



Weeds were converted into organics by SSBT

Weed free cotton under SSBT and *Sesbania aculeata* as in situ cover crop





Comparing SSBT with cover crops against pre emergence pendimethalin

SSBT and cover crop



Pendimethalin treated (no ssbt and nocover crop)



Crotalaria juncea as cover crops



Sesbania as cover crop



Mimosa invisa as covercrop



Vigna unguiculata as cover crop



Cover crop removed and applied



Nodule formation at harvest of cover crops



Weed count on 30 DAS as influenced by SSBT and Cover crops

Treatments	Weed count/ m ² on 30 DAS
1.SSBT followed by <i>Mimosa invisa</i> + HW	67.25
2. SSBT followed by <i>Crotalaria juncea</i> + HW	63
3.SSBT followed by <i>Sesbania aculeata</i> + HW	46.75
4 SSBT followed by <i>Vigna unguiculata</i> + HW	49.75
5. SSBT followed by <i>Desmanthus virgatus</i> + HW	74
6 pendimethalin 1.0 kg as pre emergence + HW (Twice)	198.7
SED	17.51
CD (p=0.05%)	37.33 **



Weed count on 80 DAS as influenced by SSBT and Cover crops

Treatments	Weed count/ m ² on 80 DAS
1.SSBT followed by <i>Mimosa invisa</i> + HW	174 (13.02)
2. SSBT followed by <i>Crotalaria juncea</i> + HW	182 (13.54)
3.SSBT followed by <i>Sesbania aculeata</i> + HW	171(12.68)
4 SSBT followed by <i>Vigna unguiculata</i> + HW	158 (12.22)
5. SSBT followed by <i>Desmanthus virgatus</i> + HW	220 (14.7)
6 (pendimethalin 1.0 kg) as pre emergence + HW (Twice)	312 (19.10)
SED	1.364
CD (p=0.05%)	2.908 **



Yield attributes and Seed cotton yield as influenced by SSBT and Cover crops



Treatments	Bolls/ plant	Boll wt (g/boll)	SCY (kgs/ha)
1.SSBT followed by <i>Mimosa invisa</i> + HW	28	6.15	2147
2. SSBT followed by <i>Crotalaria juncea</i> + HW	33.4	6.08	2368
3.SSBT followed by <i>Sesbania aculeata</i> + HW	24.8	6.28	2112
4 SSBT followed by <i>Vigna unguiculata</i> + HW	34	6.03	2494
5. SSBT followed by <i>Desmanthus virgatus</i> + HW	28.2	5.92	2275
6 pendimethalin 1.0 kg pre emergence + HW (Twice)	24.9	5.82	2016
SED	1.635	0.17	105.36
CD (p=0.05%)	3.49	NS	226.58

Conclusion

- SSBT technique and application of pendimethalin and glyphosate each at 1.0 kg ai/ha is effective in exhausting weed seed bank in irrigated cotton
- Growing of leguminous cover crops to smother weeds is the most sustainable method to manage weeds
- Combination of SSBT with application of pendimethalin and glyphosate each at 1.0 kg ai/ha with leguminous cover crops like *Vigna unguiculata* / *Crotalaria juncea* is recommended as effective tools in IWM of irrigated cotton.



Thank You