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# Prospects and Problems of Herbicide Resistant Crops

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Productivity gains encompass essentially all factors of agricultural production. With the rapid advances in biotechnology, a number of genetically modified (GM) crops carrying novel traits have been developed for commercial agriculture production. These include insect, drought, herbicide and salinity resistance crops.

Weed are causing extensive losses which increased the cost of production, decreased quality and quantity of produce, reduced aesthetic value of landscapes that they thrives in, health effect on humans and pets, and other undesirable effects such as fuel for forest fires etc. over the past several centuries, weeds have been controlled with mechanical, biological and cultural an dchemical control tools.

**What is HRCs**

Herbicide resistance is the inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type. In a plant, resistance may be naturally occurring or induced by such techniques as genetic engineering or selection of variants produced by tissue culture or mutagenesis. Presently HRC's are not in use in India. However, many private companies are in the process of obtaining the permission from GEAC and RCGM. Currently herbicide resistant crop developed under genetic engineering are canola, maize, soybean, cotton, rice, tobacco, sugarbeet, rapeseed, tomato and potato.currently more than 244 weed species (142 dicots and 102 monocoats) are herbicide resistant.

**Benefits of HRCs**

- Lower labour and production costs
- Reduction in use of chemical inputs and improved economic gain
- Selective control of different weeds
- Increased use of environmentally bengin herbicides
- Grater timing flexibility to growers
- Reduced soil erosion
- Control of herbicide resistant weeds

**Problems of HRCs**

The increasing cultivation of HRCs crops has raised a wide range of concerns with respect to food safety, environmental effects and socio-economic issues. The scientific evidence concerning the environmental and health impacts of GMOs is still emerging.

Chinnusamy *et al*. (2011) observed that the phytotoxicity symptoms were not observed in transgenic cotton with Glyphosate application up to 2700 g a.e/ha. However, higher doses viz., 3600 and 5400 g a.e/ha shown phytotoxicity symptoms on the crop growth. Similar result was also reported by Wallace *et al*. (2011). Chinnusamy *et al*. (2011) found that maximum values of yield attributes and seed cotton yield were recorded under PI application of 2700 g a.e/ha glyphosate and minimum weed dry weight of weed observed under application of glyphosate @ 5400 g a.e/ha during winter season of the year 2010-11. Ravishankar *et al*. (2011) results revealed that higher grain yield was recorded by POE application of glyphosate @ 1800 g a.e/ha in transgenic maize hybrid 900 M Gold and Hishell during *kharif*, 2009 and *rabi*, 2009-10 respectively but weed dry weight the lowest in glyphosate @ 3600 g a.e/ha in transgenic maize. Similar results of the same crop were also reported by Reddy and Koger (2004) and Johnson *et al*. (2003). Owen *et al.* (2010) results indicated that the glyphosate-resistant and glufosinate-resistant soybean cultivars yielded 315 and 265 kg/ha higher than the non-GM, respectively. Wilcut *et al*. (2003) conducted an experiment at 22 locations in 8 cotton producing states of USA. They concluded that roundup ready varieties of cotton gave 3.3% less yield, but 33% less weed management cost than conventional cotton variety. Reddy (2003) reported that one post application of 410 g ai/ha glufosinate was most profitable in soybean. Similarly, significantly the lowest weed biomass in 360 g a.e/ L glyphosate applied at once gave the highest yield and net return in canola. (O'donovan *et al.*, 2006). Chinnusamy *et al*. (2011) noted that there was no any adverse effect of glyphosate application on plant height and dry matter production of succeeding crops *i.e.* sunflower, soybean and pearlmillet. Reddy *et al.* (2011) observed that application of glufosinate @ 450 g a.e/ha increase protein and oleic acid in herbicide resistant soyabean. Wallace *et al*. (2011) found that micronaire, strength, length uniformity index of cotton was not influenced by glyphosate @1300 g a.e/ha and glufosinate @ 600 g a.e/ha. Glyphosate application upto 5400 g a.e/ha not affected population of bacteria, fungi and actinomycetes in the soil (Chinnusamy *et al*., 2011). Kremer and Means (2009) observed that application of glyphosate @ 840 g a.e/ha in soybean increased root-colonizing *Fusarium* while, Mn transformation and root nodulation was decreased. Similar results were also reported by Kremer *et al.* (2005) for soybean. Mirande *et al.* (2010) reported that glyphosate application influenced molting in larvae, weight of pupae, fecundity and fertility of *Eriopis connexa*.

**Conclusion**

- Herbicides and their associated HRC's may increase crop yield, improve product quality, economics and it is safer to plants.
- The increasing cultivation of GM crops has raised a wide range of concerns with respect to weed shifts, gene flow, biodiversity and socio-economic issues. From the food and health perspective

Future thrust

- Many microbial and plant genes involved in herbicide resistance may be identified and evaluated to be introduced into other crop plants.
- Long term study on bio-safety of ecological impacts of use of HRCs required
- More research in HRC's may be required in India.

**References**

Chinnusamy, C., Mithya, C., Muthukrishnam, P. and Jeyaraman, S. (2011). Agronomic management and benefits of Glyphosate tolerant transgenic cotton.

Johnson, W., Li, J. and Wait, J. (2003).Johnsongrass control, total nonstructural carbohydrates in rhizomes and regrowth after application of herbicides used in herbicides resistant corn (Zea mays). *Weed Technology* 17:36–41.

Kremer, R. and Means, N. (2009).Glyphoste and glyphosate resistant crop interactions with rhizosphere microorganisms. *European Journal of Agronomy* 31:153-161.

Kremer, R., Means, N. and Kim, S. (2005). Glyphosate affects soybean root exudation microorganisms. Accepted for publication in *International Journal of Analytical Environmental Chemistry* 1-10.

Mirande, L., Haramboure, M., Smagghe, G. and Schneider, M. (2010). Side effects of glyphosate on the life parameters of eriopis connexa (coleopteran: coccinelidae) in Argentina. *Communications in agricultural and applied biological sciences Ghent University*, 75/3: 367-372.

O'donovan, J., Harker, K.., Clayton, G. and Blackshaw, R. (2006). Comparison of a glyphosate resistant canola (Brassica napus L.) system with traditional herbicides regimes. *Weed Technology* 20:494–501.

Owen, M., Pedersen, P., Bruin, J., Stuart, J., Lux, J,, Franzenburg, D. and Grossnickle, D. (2010). Comparison of herbicide programs in conventional, glufosinate and glyphosate/dicamba;resistant sybean across Nebraska. *Crop Science*, 50: 2597-2604.

Ravisankar, D., Muthukrishnam, P. and Chinnusamy, C. (2011). Evolution of bio-efficacy, weed control and crop productivity in herbicide resistant ransgenic corn hybrids (MON89034 x NK603). *Biotechnology, Bioinformatics and Bioengineering*. 1(3):369-374.

Reddy, K,. Zablotowicz, R., Bellaloui, N. and Ding, W. (2011). Glufosinate effects on nitrogen nutrition, growth, yield and seed production in glufosinate resistant and glufosinate sensitive soybean. *International Journal of Agronomy* Article ID 109280, 9.

Reddy, K. (2003). Impact of rye cover crop and herbicides on weeds, yield, and net return in narrow-row transgenic and conventional soybean (Glysine max). *Weed Technology* 17:28–35.

Reddy, N. and Koger, C. (2004). Live and killed hairy vetch cover crop effects on weeds and yield in glyphosate resistant corn. *Weed Technology* 18:835–840.

Wallace, D., Sosnoskie, L., Culpepper, S., York, A. and Pierson, J. (2011).Tolerance of glytol and glytol + libertylink cotton to glyphosate and glufosinate in the southestern US. *The Journal of Cotton Science* 15:80–88.

Wilcut, J., Hayes, R., Nichols, R. and Brown, M. (2003). *Nc State University Technical Bulletin pp.* 319.