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Review Article

New Innovation Approaches in Plant Protection System

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A B S T R A C T

The objective of this paper is to explore the extent to which systems approaches to innovation are reflected in the crop protection literature and how such approaches are used. The discovery and introduction of potent new pesticides, new technology and new farming system have demonstrated that excellent weed and insect control can be achieved with minute effort and less liberty. In addition to the use of crop protection chemicals, Indian agriculture needs to focus on specific solutions to enhance crop productivity. It is imperative for us to adopt efficient agronomy practices, fertigation, seed treatment, biotechnology and Plasticulture to reduce wastage and attain self-sufficiency in agricultural output. Integrated pest management is one of the most effective and sustainable ways of tackling the issue of pests and diseases in Indian agriculture.

Introduction

Agriculture holds a prime importance in the socio-economic fabric of India. The sector has remained backbone of the Indian economy and presently accounts for ~15% of the country's GDP. Nearly 58% of the rural households rely on agriculture as their principal means of livelihood. Being a source of livelihood and food security of the nation, higher growth in agriculture assumes great importance and is matter of concern. Thus to accelerate high growth and ensure sustainability, combined effort in terms of technology, policies and institutional support has to be adopted. Thus in the next generation agriculture practices, there is a need to do more with less and increase the yield by optimizing the available resources. (Leeuwis, 2004). Therefore it is essential to adopt modern methods to ensure more optimized and make productive usage of the resources to harness the growth potential of this sector. One of the contributing factors to the gap between theoretical and actual crop yields lies in the effective use of crop protection products. In addition to a shortage in the discovery of new active ingredients

and the steady buildup of pesticide, fungicide, insecticide and herbicide resistance, increased pressure is now being brought to bear on crop protection products through recent legislation adopting an increasingly hazard, rather than risk-based approach to their use in India. There is widespread concern among the agricultural community that the results of this legislation will be to withdraw from use chemicals that play key roles in crop protection. As these chemicals are subject to the new requirements during this decade, there needs to be joined-up thinking across the public and private sectors of the agricultural community to determine how to crops might best be protected within the regulatory framework.

Indian crop protection market

To meet the food & nutrition needs of a growing population requires a sustainable approach that puts thrust on increasing productivity against the background of lower yields and decreasing farm sizes. Approximately 25% of the global crop output is lost due to attacks by pests, weeds and diseases which doesn't predict well for farming given the critical challenges ahead and thus agrochemicals have an increasing role to play.

Agrochemicals can play a major role in enhancing productivity and crop protection post-harvest. Insecticides are the largest sub-segment of agrochemicals with 60% market share, whereas herbicides with16% market share are the fastest growing segment in India. India is the fourth largest global producer of agrochemicals after the US, Japan and China. (Michael E. Mann.1990) This will translate into a better demand for crop protection chemicals. Input prices for crop protection chemical companies are likely to remain subdued in the near future which will impact selling prices for farmers. Due to this, while the market could grow in volume terms, but in value terms, growth would be moderate.

Next generation crop-protection and crop enhancement solutions

Indian Agriculture needs to ensure food and nutritional security for the nation due to growing population, increasing urbanization at the expense of agricultural resources and loss of agricultural produce due to pest attacks. It therefore becomes imperative to implement measures not only for crop protection but also for enhancing the crop productivity.

Integrated pest management

Integrated Pest Management (IPM) is a sustainable approach to pest management using a combination of techniques like Biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

In this process, Pesticides are used only after ensuring their necessity as per established guidelines, and treatments are made with the goal of removing only the target organism.

The most effective, long-term way to manage pests is by using a combination of methods that work better together than separately. Approaches for managing pests can be grouped in the following categories and methods.

Seed treatment

Seed treatment complexity can range from a basic dressing to coating and pelleting.

Seed dressing

This is the most common method of seed treatment. The seed is dressed with either a

dry formulation or wet treated with a slurry or liquid formulation. Dressings can be applied at both farm and industries.

Seed coating

A special binder is used with a formulation to enhance adherence to the seed. Coating requires advanced treatment technology, by the industry.

Seed pelleting

The most sophisticated Seed Treatment Technology, resulting in changing physical shape of a seed to enhance pelletibility and handling. Pelleting requires specialized application machinery and techniques and is the most expensive application.

Bio-technology

Crop biotechnology broadly includes areas of development of transgenic crops, structural and functional genomics and market-assisted breeding. Sequences from varied sources like bacteria, viruses and eukaryotic systems can be transferred to plants to develop transgenic crop varieties. GM or transgenic crop is a plant that has a novel combination of genetic material obtained through the use of modern biotechnology.

For example, a GM crop can contain a gene(s) that has been artificially inserted instead of the plant acquiring it through pollination.

The resulting plant is said to be "genetically modified" although in reality all crops have been "genetically modified" from their original wild state by domestication, selection, and controlled breeding over long periods of time. Presence of the desired gene that controls the trait can be tested for at any stage of growth. The precision and versatility of today's biotechnology enable improvements in food quality and production to take place more rapidly than when using traditional breeding.

Indian private seed companies and public sector research institutions are working on the development of various biotech crops aiming at improving pest resistance, nutritional enhancement, drought tolerance and yield enhancement qualities

Modern Bio-Technology offers the following benefits-

In some cases, an effective transgenic crop-protection technology can control pests better and more cheaply than existing technologies

It can endow crops with tolerance to abiotic stress such as drought, salinity, high and low temperature thus enabling production even in unfavorable conditions

It may help in enhancing the yield and quality with higher photosynthesis, control of maturity and nutritional value thus resulting in increased food security and reduced malnutrition

It helps adding value and diversifying the use of crops other than food and feed such as medical and industrial purposes.

Precision farming

Precision farming is defined as an Information Technology based farm based system to identify, analyze and manage variability within fields for optimum profitability, sustainability and protection of land resource.

Latest Information technologies can be used to make better decisions about many aspects of crop production.

Precision Farming

Table.1 Benefits of plasticulture applications

Plasticulture Application	Water Saving (%)	Water Use Efficiency (%)	Fertilizer Use Efficiency (%)
Drip Irrigation	40-70	30-70	20-40
Sprinkler Irrigation	30-50	35-60	30-40
Plastic Mulching	40-60	15-20	20-25
Greenhouse	60-85	20-25	30-35
Shade Nets	30-40	30-50	Not Available
Tunnel	40-50	20-30	Not Available
Farm Pond Lined with Plastic Film	100	40-60	Not Applicable

Source: Industry reports, Analysis by Tata Strategic

Precision farming involves looking at the increased efficiencies that can be realized by understanding and dealing with the natural variability found within the field. (Singh, *et al.,* 2016)

A variety of tools including hardware, software and best management practices are available to ensure precision farming some of which are listed below.

- Global Positioning System Receivers
- Yield monitoring and mapping
- Grid soil sampling and variable-rate fertilizer application
- Remote sensing
- Crop scouting
- Geographic information systems (GIS)
- Information management
- Quantifying on farm variability
- Variability of soil water content

Each of these geo-referenced data layers helps subdivide a large field area into smaller management zones. Using small management zones reduces waste while increasing production potential.

One example of a precision agriculture practice is to evaluate the natural soil variability of a field. If the soil in one area holds water better, crops can be planted more densely and irrigation can be sparing. Or, if the plot is used for grazing, more cattle can graze than a similar area of poorer quality soil. By studying these factors and using precision agriculture, farmers are able

to produce more food at a fraction of the cost.

Farmers also conserve soil for sustainable food production. Precision agriculture results in a stable food supply, which results in a strong community.

Injector jets

This type is offered in the meantime by all important jet manufacturers and represents around 75% of current new sales. Fears that the rougher droplet spectrum might reduce the spray's biological efficacy have been vanquished by many trials in recent years. Advantages in practice for such jets include especially their reduced drift effect which allows a reduction in minimum distance from surface water bodies compared with that possible with former standard flat spray jets (Chave *et al*., 2012).

The early morning and late evening hours most suitable for spraying are in many cases not enough nowadays so that area performance is increased through higher operational speeds and night work. As shown by BBA investigations, boom suspension and pendulum systems with current mounted and self-propelled sprayers are so designed that a sufficiently consistent application quality, even at higher speeds, can still be achieved. These developments are important nowadays where basic principles of good management practice recognise as acceptable the use of injector jets at speeds of up to 10 km/h.

Plasticulture

Plasticulture refers to use of plastics in agriculture and horticulture. Plasticulture has a number of applications in modern agriculture and promises to transform Indian agriculture and bring in the "Second Green Revolution". Both the quality and the quantity of the crops and other farm products can be optimized using various techniques. Plastics which are most widely used in agriculture, water management and related applications are PE, (LLDPE, LDPE and HDPE), PP and PVC.

The application of Plasticulture can substantially decrease the costs and therefore can lead to higher productivity with a better quality of crops. Table 1 shows the water saving, water use efficiency and fertilizer use efficiency by various plasticulture applications. Each application can drastically save water by about 30 to 100%.

Mobile agri-computer

The armatures and control systems of current sprayers must be so designed and sited that they can be easily seen and operated from the driver position. For this, hand operated armatures (preferred for mounted implements), mechanically or electrically remote- controlled armatures and electronic regulating systems are used with displays or terminals (Heinz Ganzelmeier, 2001). The electronic equipment is widely applied in the meantime and range from simple monitors to mobile agri-computers. Farmers often complain about poor compatibility between electronic equipment from different manufacturers usually making impossible information exchange between differently-sourced equipment.

References

Chave, M., Ozier-Lafontaine, H., Noel, Y., 2012. Towards agricultural innovation systems: designing an operational interface. Outlook Agric. 41, 81-86.

Heinz Ganzelmeier, 2001. AGRITECHNICA, Brunswick

Corporation. 378: (56)

Kropff, M.J., Bouma, J., Jones, J.W., 2001. Systems approaches for the design of sustainable agro-ecosystems. Agric. Syst. 70, 369-393

Leeuwis, C., 2004. Communication for Rural Innovation. Rethinking Agricultural Extension (with Contributions of Anne van den Ban). Blackwell Science, Oxford. 340- 342.

Michael E. Mann. 1990. Current trends and new directions in crop protection. American Journal of Industrial Medicine. 18(4):499-504.

Singh, P. S., Kaundinya Ram and Mudholkar Ram K. (July 2016). Next Generation Indian Agriculture - Role of Crop Protection Solutions (*A report on* Indian Agrochemical Industry) pp: 5-56.