



Rolling Stem Applicator - An Eco-Friendly, Low Cost, Input Saving and Drudgery Reducing Tool for Managing Sucking Pests of Cotton

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ABSTRACT

The present study was taken to assess the performance of Rolling stem applicator in comparison with normal traditional method of hand spraying in cotton for sucking pests. The study revealed that Rolling stem applicator was more efficient than spraying for increased crop protection and reducing cost of cultivation. With the rolling stem applicator, the time period and quantity of insecticide required for the application were lesser as compared to spraying, subsequently the cost was also reduced. Even the quantity of spray fluid required for the rolling stem applicator was very less i.e. 750-1250 ml/ha. The number of labour required for application was less for making use of rolling stem applicator i.e. 2-3 labour to cover one hectare area which ultimately reduced the cost incurred for labour on plant protection. Even, the time required for application by rolling stem applicator was found to be less and therefore, within a span of 6 hr of time by rolling stem applicator 1.6-2.4 ha area could be covered in a day. Thus, use of the rolling stem applicator reduced the cost of cultivation to a farmer, drudgery, saved input and safe to natural enemies.

Key Words: Hand Spraying, Pesticides, Rolling stem applicator, Sucking pests.

INTRODUCTION

Cotton one of the major commercial crop grown in India by majority of the farmers. In India, cotton ecosystem harbours about 162 insect pest species and the monetary value of estimated yield losses due to insect pests has been estimated to be Rs 3,39,660 million annually (Dhaliwal *et al*, 2010). Pink bollworm (*Pectinophora gossypiella*), American bollworm (*Helicoverpa armigera*) and spotted bollworm (*Earis spp.*) are the major boll feeders (Babar *et al*, 2013). After introduction of Boll guard technology (Bt) in 2002, the productivity of cotton increased, losses due to insect pests decreased and the insecticide use was also reduced. Transgenic Bt cotton can effectively control specific Lepidopterous species, but there is lack of resistance against sucking insect pest (Sharma and Pampathy, 2006). Even though the recently introduced Bt cotton hybrids are resistant to bollworms, most of them succumb to the sucking

pests scourge (Kalkal *et al*, 2009; Murugesan *et al*, 2009). After the introduction of Bt technology, most of the pesticides spray were reduced because of the less bollworm incidence. In cotton, sucking pests are the major problem which mainly includes thrips, white flies, aphids and mealy bugs. The sucking pests start it's feeding by sucking the plant sap from the plant right from the sowing to harvesting. The pests, if not properly managed in the early stages, cause damage to the plant which includes reduction in the plant growth, effect on the flowering, fruiting, and transmission of viral diseases and ultimately reduction in yield. In an unprotected field, the effect on yield losses in Bt cotton due to sucking pests was about 26.21 per cent (Makwana *et al*, 2018). Farmers to manage the pest problem mainly go for Hand spraying of different pesticides at different intervals of the crop period. Hand spraying is a tedious and laborious process which includes mixing of chemicals in more quantity for number

of times, increase cost of cultivation due to more number of labourers required for spraying and more quantity of pesticides, increase risk of human beings to the hazardous chemicals, indirect toxic effect on the beneficial insects and other creatures. Non-availability or shortage of labour during peak crop stages make the farmer to postpone or delay in spraying which ultimately increase the pest load and cause difficult to manage the pests after its severity.

Keeping in view of all the problems faced by the cotton farmers, to combat the difficulty in spraying the pesticides for sucking pests, by studying all the factors and taking into consideration, KVK, Wyr, Khammam has developed a simple technology of controlling the sucking pests without spraying *i.e.* Rolling Stem applicator. Hence, study was conducted to assess the general attributes, its use and the performance, cost incurred of Rolling stem applicator and its comparison with hand spraying of pesticides.

MATERIALS AND METHODS

The study has been conducted in Nacharam village under NICRA of Krishi Vigyan Kendra, Wyr, Khammam district, Telangana State. The advantages and benefits of hand spraying and rolling stem applicator were compared.

Specifications of Rolling Stem Applicator

- High density foam (35 mm X 160 mm)
- Plastic handle (Length 2.5 feet, 2.5 cm diameter)
- Foam holder
- Weight of the applicator (250g)

The cost involved in hand spraying and rolling stem applicator and quantity of insecticide required for hand spraying and rolling stem applicator were assessed. Under NICRA Project at Nacharam village of Khammam District, Telangana State, the rolling stem applicator was assessed in cotton fields of farmers and compared with hand spraying. As per the recommendation of pesticides for sucking

pests in cotton, two pesticides *i.e.* Monocrotophos and water (1:4) at 30, 45 days of sowing and Imidacloprid and water (1:20) at 60d of sowing were taken and applied to the cotton field with rolling stem applicator. The control plot was maintained where the application of pesticides done by traditional hand spraying. All the factors regarding the quantity of insecticide required, time taken for application, cost of chemical and labour, ease of application were studied (Image 1).



Image 1. Rolling Stem applicator

RESULTS AND DISCUSSION

The rolling stem applicator consisted of a 2.5 feet length pipe with 2.5 cm diameter, a foam holder with high density foam (Sponge) and the weight of the applicator is 250g. The applicator can be easily operated by simply dipping the high density foam (Sponge) into the spray fluid prepared in a small bucket by mixing the enough quantity of chemical and water. Once it is dipped into the spray fluid bucket, the spray fluid will be absorbed into the high density foam (Sponge) and easily it can be applied to the base of the stem for about 15-20 plants. Likewise, the application can be done with two pesticides *i.e.* Monocrotophos and water (1:4) at 30, 45 days of sowing and Imidacloprid and water (1:20) at 60 days of sowing for the control of sucking pests. With one rolling stem applicator by hiring one labour, the chemical can be applied to any number of plants and any number of acres of land. The applicator can be again reused for the next season crop and many number of crop seasons (Image 2). Moreover, unlike the disadvantages of hand spraying, all the drudgery, drift hazard, risk to human beings and other beneficial insects were reduced in case of rolling stem applicator.

Rolling Stem Applicator

Table 1. Output of Rolling Stem Applicator in Cotton over Hand Spraying.

Sr. No	Parameter	Rolling Stem Applicator	Hand Spraying
1	Quantity of insecticide required/ha	Monocrotophos - 375 ml - 500 ml	625- 1250 ml
		Imidacloprid – 62.5 -75 ml	100-125 ml
2	Time required/ha	2.5-3.75 hr	3.75-5.0 hr
3	Drudgery	Very less	More
4	Quantity of insecticide solution required/ ha	750-1250 ml	450-500 lt
5	No. of labour required/ ha	2-3	4-5
6	Area covered/day (6 hr)	1.6-2.4 ha	1.2-1.6 ha
7	Money spent on insecticide/ ha	Rs.300/-	Rs.977/-
8	Drift losses	No	Yes
9	Toxicity to natural enemies	Negligible	More
10	Environmental pollution	Nil	More
11	Inhalation of pesticide while application	Negligible	more
12	No. of plants covered/hour	3200	2400
13	Ease of application	Very easy and comfortable	Highly laborious and require more energy

In the time period of 2.5-3.75 hr, with an quantity of 375-500 ml of Monocrotophos and 62.5-75 ml of Imidacloprid, the application of chemical can be done easily by the rolling stem applicator unlike the time period of 3.75-5 hr with an quantity of 625-1250 ml of Monocrotophos and 100-125 ml of Imidacloprid. As the quantity of chemical required for application by rolling stem applicator was very less, subsequently the cost was also reduced. The cost incurred for the monocrotophos was Rs. 170/- for application by rolling stem applicator and Rs.420/ for application by spraying. Similarly, the cost incurred for imidacloprid was Rs. 130/- for application by rolling stem applicator and Rs. 257.5/- for application by spraying. Even the quantity of spray fluid required for the rolling stem applicator was very less i.e. 750-1250 ml as compared to spraying which require 450-500 litres of solution per hectare. With the small quantity of

spray fluid, the application by rolling stem applicator was easy and the number of labour required for application was very less i.e. 2-3 labour is sufficient to cover one hectare which ultimately reduces the cost incurred for labour for plant protection, unlike the traditional spraying method where more number of labour required i.e. 4-5 (2 or 3 men + 2 woman) which increases the cost of cultivation to farmer. The time of application by rolling stem applicator was very less and within a short time more number of area can be covered i.e. within a span of 6 hours of time by rolling stem applicator 1.6-2.4 Ha can be covered in a day whereas 1.2-1.6 Ha of area per day can be covered in the span of 6 hours of time period by spraying. Thus, more area can be covered in a short time which enables the farmer to go for timely plant protection measure of a larger area in a shorter time period. Thus, in overall the application by rolling stem applicator reduces the



KVK Scientists explaining the stem application usage in field.



Conducting of method demonstration with Rolling Stem Applicator



Stem application with cotton



Stem application

Image 2. Application of chemical by Rolling Stem Applicator in Cotton

cost of cultivation to farmer, drudgery, input saving and safe to natural enemies.

Advantages

1. The technique is well suited for areas where there is severe water scarcity because small quantity of water is required.
2. It does not need any costly equipment and involves no skill.
3. No harm to natural enemies as the chemical is not exposed to the wind.
4. No drudgery because the applicator can be easily carried without much energy and not require to bag it on the shoulders.
5. No drift hazards as like spraying the chemical will be drifted when applied to the plants because of wind and other factors.
6. Easy in application because the equipment is light in weight.
7. Insecticide saving because the chemical will be absorbed into the sponge will be directly applied to the plant without any wastage as like hand spraying where the chemical wasted because of drift and more requirement of water.
8. No environmental pollution because the chemical is not exposed to environment.
9. Labour saving because the application can be done easily as the requirement of water is less, quantity of chemical is less and once the spray fluid is ready, it can be applied.
10. Risk of exposure to human beings is less because the chemical is not drifted or not exposed to the wind.
11. Cost incurred is very less as the amount of chemical reduced.

Rolling Stem Applicator

CONCLUSION

Cotton is an important crop and sprayings done by the farmers for control of sucking pests require more number of labour and more quantity of chemical required which increases the cost of cultivation of the farmers for growing the crop and also also risk of exposure to human beings and beneficial insects is increased. Even, the drudgery produced during spraying is more which cause pain to the labour engaged for application. For a small and marginal farmer, it will be a more burden when the cost of cultivation increases. Rolling stem applicator will serve as an effective eco friendly tool in the IPM strategy of cotton as it is very easy to handle and apply, less risk to human beings, environment and beneficial insects, no drift hazard and overall reduces the cost of cultivation to the farmers which benefits the poor small and marginal farmers.

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