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## Traditional wisdom of hill farmers: Validating practice of growing flowering plants around field for natural insect control in J&K

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### Abstract

Food growers in India have long believed in insectary plantings as traditional wisdom to attract beneficial creatures in and around their fields. Therefore a renewed interest in employing the age-old farming techniques re-enforcing them with modern scientific approach is required for natural control of insect pests. In this study we conducted extensive surveys in farming households to collect and document this indigenous technical knowledge (ITK) and evaluated it scientifically in the field. It was found that some farmers grow combination of seed mixtures coriander + carrot (20%), some are grow coriander + carrot + fennel (22%), some are coriander + bishop weed + fennel (25%), some are grow combination of coriander + berseem + fennel (19%) and some are grow combination of all mixtures (14%). However it was interesting to note that very few farmers were aware about the eco-friendly insects that are promoted by these plants. Scientific validation studies however revealed that ecosystem services are promoted by these insects in term of pollination, predation and parasitism in the field. The frequency of occurrence by these insect groups was also increased over control i.e. without growing these insectary plants.

**Keywords:** Indigenous technical knowledge, insectary plants, traditional wisdom

### Introduction

Traditional farming practice by a community is a system of farming based on the community's accumulated knowledge through generation after generation of cultivating various crops in their own unique way in adaptation to the surrounding environment. However, agricultural practices have been seeing transformation from age old traditional practices to the present-day advanced procedures. For instance, indiscriminate use of chemicals for increasing production as well as for controlling pest population has rendered the soil less fertile and has created resurgent pest population with resistive strains. Notwithstanding, the traditional understanding about crop protection from pests infestation can be used along with modern techniques, to reduce the dependency on chemicals.

The indigenous farming system which was once prevalent all over the world is now almost vanished from the developing countries and confined to some tribal dominated regions of developing countries (Thurston, 1992) [1]. Indiscriminate use of chemicals for increased crop production has given rise to resurgent pest populations with resistive strains. Therefore a renewed interest in employing the age-old farming techniques re-enforcing them with modern scientific approach which is required for natural control of insect pests Keeping this in view, a survey was carried out in Jammu and Kashmir, wherein farmers used to grow a blend of flowering and mixture of millets, around his farmland. Probably they were worsen with the ecosystem services which were unfortunately not documented anywhere. One can assume that through these plants he wanted to attract birds and friendly insects. In fact this was habitat approach that scientists in developed nations are exploring scientifically. Unfortunately indigenous farmers developed environment friendly relationship with his farmland something more than a commercial treating the soil as a living, dynamic entity. The sensible approach to disease resistance and pest control was to grow sturdy crops in a healthy environment- to drift along with nature, rather than battling against it.

In this era of natural farming, we collected and documented the knowledge about traditional practices of pest management. It was found that the people used this knowledge right from sterilization of the seeds before sowing through harvesting of the crops to protect against pests

such as thrips, rice stem borer (*Scirpophaga* sp.), rice hispa, rice Gandhi bug (*Leptocorisa* sp.) and stored grain pest as rice moth (*Sitotroga cerealella*), rice weevil (*Sitophilus oryzae*) etc. It was also observed that, though the people possessed knowledge about traditional practices of pest management majority of them do not practice it and some of them which use these techniques are small land holding farmers.

### Materials and Methods

Extensive surveys were carried out in farming households in selective villages (Rakh Chatha village and Govindpura village of Chatha under Jammu district, Jammu & Kashmir) and information was obtained using interview and questionnaire method as described by Deka *et al.*, (2006) [2]. The questionnaire included the following:

- Do you know about insectary plants and does it include protecting crops from pest?
- If you know, where from have you come to know?
- Do you follow these practices for protecting your crops from pest damage?
- If yes, how do you apply them?
- How much pest suppression is obtained?

### Scientific validation

Based upon the inputs obtained from farmers we laid out a scientific trial including combinations of many insectary plants that were assigned to various treatments like coriander + carrot, coriander + carrot + fennel, coriander + bishop weed + fennel, combination of coriander + berseem + fennel and all the plant mixtures including control. These treatments were grown in Randomized block design (plot size 3 x4 meter) and evaluated for species diversity and occurrence of natural enemies at peak incidence through various techniques like sweep netting and suction sampling. The total number of

species encountered in each treatment was recorded and their mean frequency of occurrence was pooled as predator, pollinator and parasitoids.

### Statistical analysis

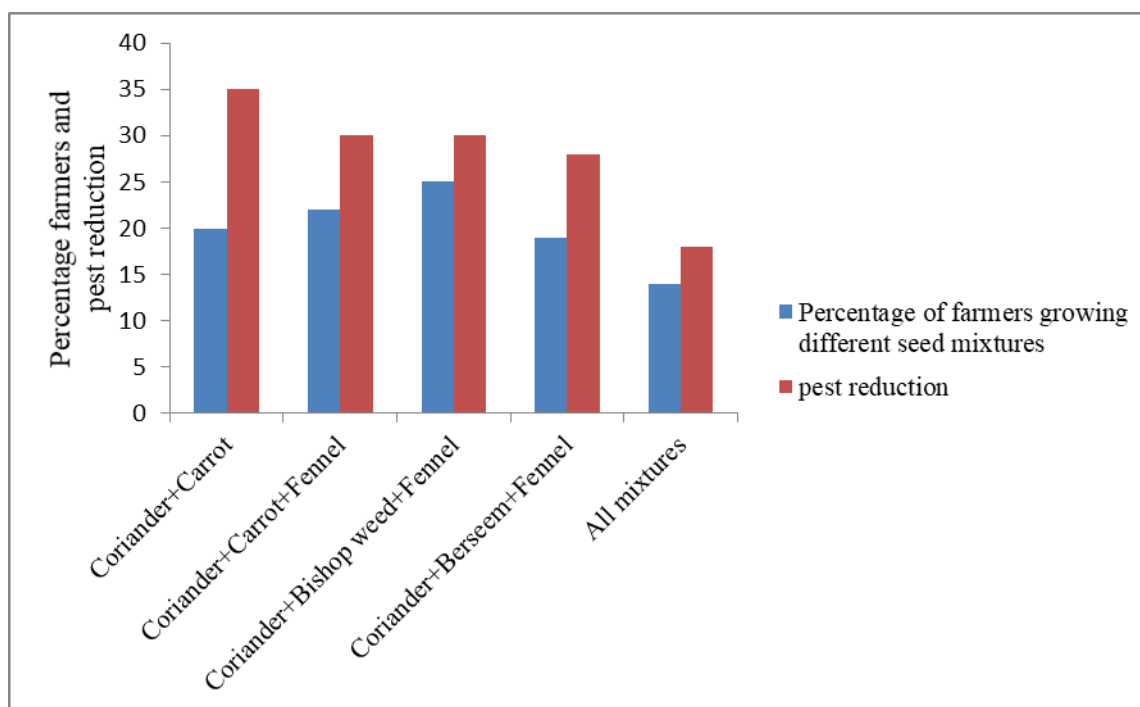
The data was subjected to appropriate transformation before analysing through one way ANOVA followed by post hoc tests.

### Results

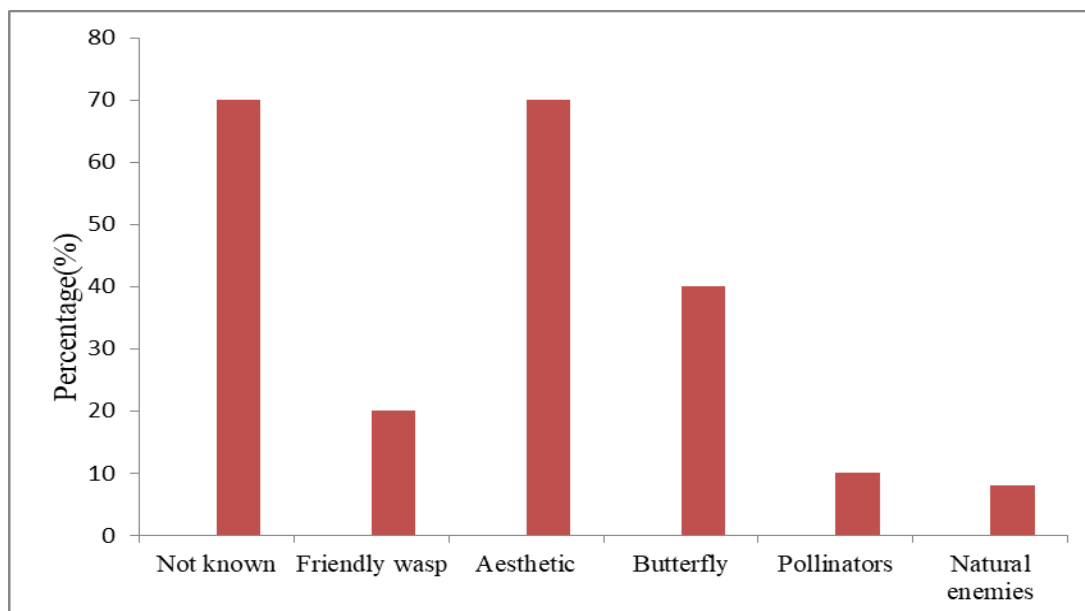
In our study, surveys were conducted in selective villages and we found that farmers grow different mixtures around the crops. Some farmers grow combination of seed mixtures coriander + carrot (20%), some are grow coriander + carrot + fennel (22%), some are coriander + bishop weed + fennel (25%), some are grow combination of coriander + berseem + fennel (19%) and some are grow combination of all mixtures (14%) (fig.1)

During the survey, different farmers said to grow combination of seed around crops to reduce pest populations. Farmers (35%) grow coriander + carrot, some farmers (30%) are grow coriander + carrot + fennel combination, some are grow coriander + bishop weed + fennel (30%), some are grow combination of coriander + berseem + fennel (20%) and some farmers (18%) grow combination of all mixtures to reduce pest population (fig. 1).

Surveys were carried out in farming households in selective villages and then we asked how to reduce pest incidence. Some farmers (75%) never know how to reduce pest incidence, 20% farmers said due to some friendly wasp, 70% farmers said that by growing these plants feels aesthetic, some farmers (40%) said that due to butterfly, 10% said that due to pollinators and 8% farmers said that caused by natural enemies to reduce pest incidence (fig. 2).



**Fig 1:** Percentage of farmers and pest reduction known in different seed mixtures during survey.



**Fig 2:** Percentage of farmers to know about pest incidence in different seed mixtures during survey.

**Scientific validation**

Based upon the information obtained from farmers we laid out a scientific trial including combinations of many insectary plants that were assigned to various treatments like coriander + carrot, coriander + carrot + fennel, coriander + bishop weed + fennel, combination of coriander + berseem + fennel and all the plant mixtures. First treatment (coriander + carrot) was observed 8 numbers of species (predator, pollinator and parasite). In second, treatment (coriander + carrot + fennel) was observed 10 number of species (predator, pollinator and parasite), third treatment (coriander + bishop weed + fennel) was observed 8 number of species (predator, pollinator and parasite), forth treatment (coriander + berseem + fennel) was observed 6 number of species (predator, pollinator and parasite) and fifth treatment (coriander + carrot) was observed 9 number of species (predator, pollinator and parasite) through sweep netting method. The mean frequency of

occurrence of predator, pollinator and parasite was observed in different treatment through sweep netting (Table 1). Similarly, through suction trap method observations were recorded in different treatment viz., first treatment (coriander + carrot) was observed 4 number of species (predator, pollinator and parasite), second treatment (coriander + carrot + fennel) was observed 7 number of species (predator, pollinator and parasite), third treatment (coriander + bishop weed + fennel) was observed 6 number of species (predator, pollinator and parasite), forth treatment (coriander + berseem + fennel) was observed 3 number of species (predator, pollinator and parasite) and fifth treatment (coriander + carrot) was observed 4 number of species (predator, pollinator and parasite). The mean frequency of occurrence of predator, pollinator and parasite was observed in different treatment through suction trap method (Table 1).

**Table 1:** Number of species and frequency of occurrence of species noticed in different treatments through different methods of sampling (sweep netting and suction trap method).

Method of sampling		Treatments					
Method of sampling	Number of species	coriander+ carrot	Coriander + carrot + fennel	Coriander + bishop weed + fennel	Coriander + berseem + fennel	mixture of all plants	
	Sweep netting	Predators	4	5	5	4	5
Pollinators		3	3	2	1	2	
Parasite		1	2	1	1	2	
Total		8	10	8	6	9	
<b>Mean frequency of occurrence</b>							
Predators		54	63	60	57	61	
Pollinators		21	24	30	28	32	
Parasite		13	17	19	15	18	
Total	88	104	109	100	111		
Method of sampling		Treatments					
Method of sampling	Number of species	coriander+ carrot	Coriander + carrot + fennel	Coriander + bishop weed + fennel	Coriander + berseem + fennel	mixture of all plants	
	Suction trap	Predators	2	4	3	2	3
Pollinators		1	2	1	1	1	
Parasite		1	1	2	0	1	
Total		4	7	6	3	4	
<b>Mean frequency of occurrence</b>							
Predators		25	32	29	27	3	
Pollinators		10	13	17	12	19	
Parasite		7	9	10	8	12	
Total	42	54	56	47	34		

## Discussion

In our study, it was found that most of the farmers were aware of the traditional farming practices involving pest management. It was observed that the people received the knowledge from their forefathers and from the society. During the survey it was found that farmers grow different mixtures around the crops. Some farmers grow combination of seed mixtures coriander + carrot (20%), some are grow coriander + carrot + fennel (22%), some are coriander + bishop weed + fennel (25%), some are grow combination of coriander + berseem + fennel (19%) and some are grow combination of all mixtures (14%) for the reduction of pest incidence. Based upon the inputs obtained from farmers we laid out a scientific trial including combinations of many insectary plants that were assigned to various treatments like coriander + carrot, coriander + carrot + fennel, coriander + bishop weed + fennel, combination of coriander + berseem + fennel and all the plant mixtures. This scientific validation showed that farmers engaged in such traditional farming are suitable for pest management without the use of chemicals. Jervis *et al.* (1993) <sup>[3]</sup> suggested that beneficial insectary planting is a form of conservation biological control which can be procured by the introducing flowering plants into agricultural and horticultural systems to increase availability of nectar and pollen resources to aphidophagous hoverflies and parasitic Hymenoptera. The potential of establishing flowering plants in or around fields to attract natural enemies and enhance biological control of crop pests in adjacent fields have also been demonstrated by several scientists (Roy *et al.*, 2008) <sup>[4]</sup>. However, natural enemies are selective in their flower feeding and show preferences for certain plant species only. Baruah *et al.*, (2016) <sup>[5]</sup> suggested that agricultural practices have been seeing transformation from age old traditional practices to the present day advanced procedures. But the indiscriminate use of chemicals for increasing production as well as for controlling pest population has rendered the soil less fertile and has created resurgent pest population with resistive strains. Notwithstanding, the traditional understanding about crop protection from pests infestation can be used along with modern techniques, to reduce the dependency on chemicals. Keeping this in view a survey was carried out in Rakh Chatha village and Govindpura village of Chatha under Jammu district, it was found that the people used this knowledge right from sterilization of the seeds before sowing through harvesting of the crops to protect against pests such as thrips, rice stem borer (*Scirpophaga sp.*), rice hispa, rice Gandhi bug (*Leptocorisa sp.*) and stored grain pest as rice moth (*Sitotroga cerealella*), rice weevil (*Sitophilus oryzae*) etc. It was also observed that, though the people possessed knowledge about traditional practices of pest management majority of them do not practice it and some of them which use these techniques are small land holding farmers (Sharma and Gogoi, 1999) <sup>[6]</sup>. Gupta *et al.*, (2012) <sup>[7]</sup> recently suggested that the attractiveness to predators, pollinators, parasitoids and nectar accessibility is due to several factors viz., olfactory cues emitted by flowers and host-infested plants, shelter by a prolonged longevity of predators, pollinators, parasitoids feeding on floral nectar as well as by attraction of predators, pollinators, parasitoids from the surrounding area which suggest that it is important to choose the optimal set of plant family instead of the greatest species diversity.

## Conclusion

From the study, it can be concluded that the ITKs, which are prevalent among the farmers from the time immemorial, if organized and used scientifically would go a long way in the management of crop pests. It was found that some farmers grow combination of seed mixtures coriander + carrot, some are grow coriander + carrot + fennel, some are coriander + bishop weed + fennel, some are grow combination of coriander + berseem + fennel and some are grow combination of all mixtures. However, it was noted that very few farmers were aware about the eco-friendly insects that are promoted by these plants. Scientific validation studies however revealed that ecosystem services are promoted by these insects in term of pollination, predation and parasitism in the field. The traditional knowledge about pest management integrated with scientific method can be employed to check the indiscriminate use of pesticides, which in long run can be helpful in protecting the soil health and keeping the pest population below sustainable levels. This systematic approach not only protects this fast disappearing indigenous traditional knowledge under the influence of modern agriculture but also preserve the indigenous pest and disease management identity of farming communities.

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