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Beyond Bees: Integrated Pollinator Management for Unlocking Mustard Yield Potential

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Pollination is an important but often overlooked factor in mustard production. Bees and other flower-visiting insects play a valuable role by supporting effective pollination, better pod formation and healthy seed development. However, pollinator management is still not given adequate attention in many mustard production systems. Integrated Pollinator Management offers a balanced approach by combining the use of managed pollinators with the conservation of wild pollinators and their habitats. It also encourages careful and need-based pest management to reduce unnecessary risks to beneficial insects. Protecting pollinators does not mean ignoring crop protection; rather, it promotes a better balance between pest control and pollinator safety. Improving awareness about the role of pollinators can help farmers recognize them as natural partners in crop production. As agriculture moves towards more sustainable practice, pollinator-friendly management can become a promising approach for improving mustard productivity while also supporting biodiversity and healthier farming ecosystems.

Keywords: Mustard, Pollination, Pollinator Management, Sustainable Agriculture

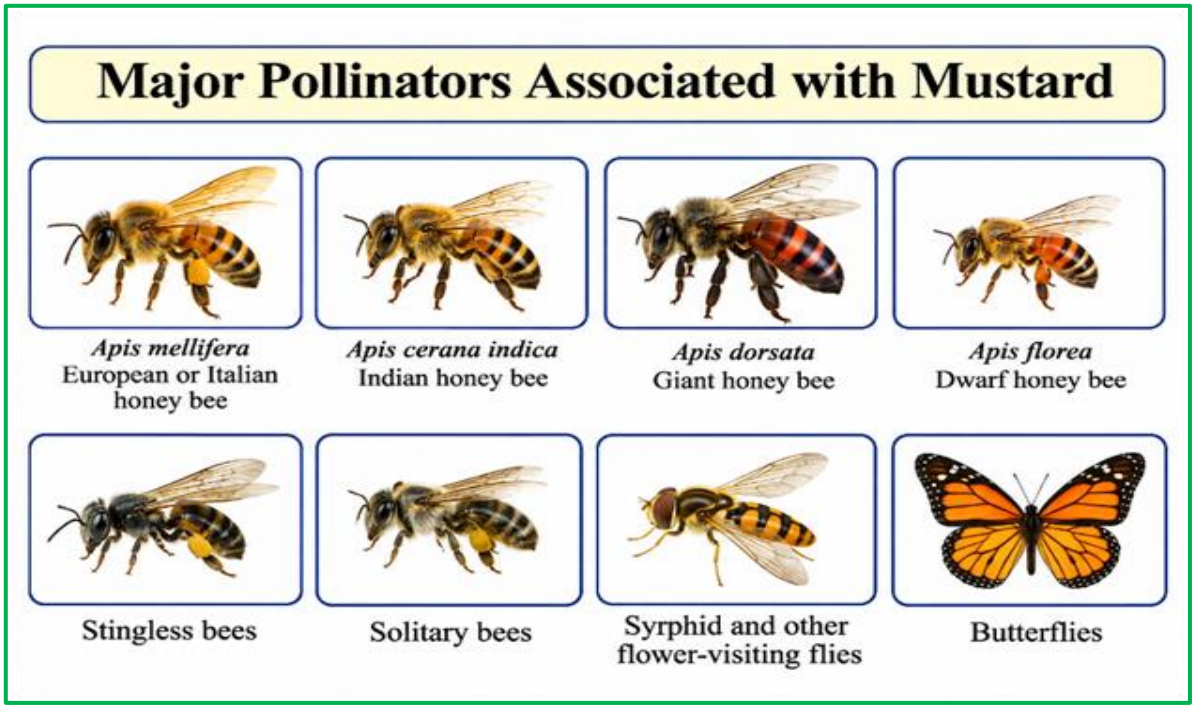
Introduction

The usual discussion on increasing mustard yield starts with improved varieties, fertilisers, irrigation and pest control when we talk about increasing mustard yield. All of these are good ones. But there is another yield factor at work in the field, working silently, the pollinators.When mustard goes to flower it is a busy place, bees fly from one yellow flower to another looking for nectar and pollen. In doing so they also carry pollen. It may seem a minor natural activity but it has a direct influence on pod setting, seed number and final yield.Pollination is an important ecosystem service recognised by the FAO, which also notes that pollinators can increase the yield and quality of agricultural crops. Both managed and wild pollinators provide this service. This is why pollination should not be seen solely as a matter of biodiversity conservation. It can also be considered as important biological input in mustard production like good seed or proper nutrient management.

Why Mustard Needs Attention to Pollination?

Mustard flowers attract a very wide variety of insects. The most familiar bees are honey bees, but they are not the only kind. Wild bees, stingless bees, flies, butterflies and other flower-visiting insects may also assist with the pollination. What is important to note is that a field of mustard is not only dependent on a single species of insect but a diverse pollinator community can improve pollination reliability. FAO also stresses the importance of biodiversity in agricultural landscapes for important pollination services and for making farming systems more resilient.More recent research has also been of interest in other pollinators. A study on *Brassica juncea* investigated flower visitation and the pollination

capacity of the stingless bee species, *Tetragonula pagdeni*, indicating that mustard pollination research is progressing beyond reliance on conventional honey bee species alone.



How Much Difference Can Pollination Make?

Research activities carried out at different locations gives a clear concept of pollination effect in mustard yield.

Case study-1: In a study of Indian mustard three scenarios were used: open pollination, pollination by *Apis mellifera* and exclusion of pollinators. The yield of crop in pollinator excluded was 13.01q ha^{-1} and open pollinated crop was 17.63q ha^{-1}. Open pollinated plants had a seed yield 35.50% greater than plants from which pollinators were excluded. Bee-pollinated plots yielded 15.57 q ha^{-1}, 19.66% more than the omitted treatment. Also, open pollination was better for pod setting, seeds/pod, 1000 seed weight and oil content (Nagpal *et al*., 2017).

Case study-2: From an experiment it was observed that insect pollination had a significant and favourable impact on mustard output. Researchers contrasted control pollination (CP), in which pollinators were not present, with open pollination (OP), in which flowers were freely available to insect pollinators and enhanced by an honey-bee colony. With fifteen different insect species, mustard had a healthy pollinator community. With 73.3% of all insects found in the open-pollinated crop, honey bees were the most frequent visitors. *Apis cerana* visited an average of 24.38 ± 0.92 flowers/400 flowers, demonstrating the significance of mustard pollination. The benefit of pollination was evident in the yield and seed quality. Under open pollination the pods per plant increased from 9.58 to 11.89 and seeds per plant from 47.35 to 64.59. The percentage of healthy seeds was significantly increased from 50.12% in pollinator excluded plants to 83.73% in open pollination and 1000 seed weight increased from 2.8 to 3.6 g. Therefore, seed yield increased from 179 kg ha^{-1} in pollinator exclusion to 227 kg ha^{-1} in open pollination, which is about 26.8% yield increase. The study demonstrates, in plain language, that pollinators, particularly honey bees, do more than just pollinate the mustard flowers. They improve the conversion of more flowers into more filled, healthier seeds, and in the end, a higher harvest (Chauhan *et al*.,2024).

Case study-3: Previous ICAR observations in Bhubaneswar had shown that honey bee-mediated pollination resulted in an increase in mustard seed production by about 12.16–21.26%. A second ICAR report said honey bee pollination raised the yield of mustard seeds in Bhubaneswar by 21%.

Integrated Pollinator Management

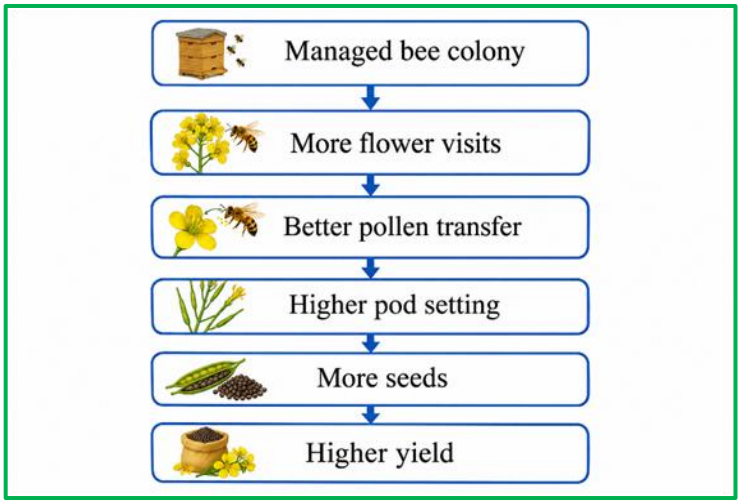
"Integrated Pollinator Management" means the management of the farm to enhance the pollination services provided by insects and to protect the insects that provide this service. It is closely related to Integrated Pest Management (IPM). Farmers need to control pests but pest control should not unnecessarily harm beneficial insects.The goal is to make pest management smarter and more balanced.

Major components of Integrated Pollinator Management are as follows-

1. Managed pollinators
2. Wild pollinator conservation
3. Pollinator-friendly habitat
4. Pollinator-safe pest management
5. Better crop and flowering-period management

Managed pollinators

Healthy colonies of honey bees placed near mustard fields during flowering can increase the visits by pollinators.But simply placing bee boxes into the field is not enough. Their usefulness can be affected by colony health, strength, placement, weather and flowering stage.Research on hybrid Indian mustard has suggested that weather, flowering conditions and crop-management factors influence honey bee activity. Pollinator abundance also varied across rows, suggesting that crop layout and management may influence pollination efficiency.There should be healthy bees when the most mustard flowers are open. Where there are beekeeping services, farmers may also work together with local beekeepers. This can create a beneficial partnership: bees have a good source of flowering resource, and the mustard crop.



Wild pollinator conservation

Not all farmers have the means to keep honey bee colonies. Nature already provides many pollinators.Wild bees and other flower-visiting insects can be important pollinators. So perhaps relying entirely on one species of managed bees may not be the best long-term approach.A farm can maintain small patches of natural vegetation, flowering field margins and suitable nesting sites to support wild pollinators. The FAO suggests practices such as protecting wild habitats, keeping flower-rich field margins, safeguarding nesting sites and reducing unnecessary risks from pesticides.That is not to say that farmers have to sacrifice a large area of productive land. Even small, well-managed areas surrounding the field can offer food and shelter for beneficial insects.

Pollinator-friendly habitat

Pollinators need food and shelter not just for the few weeks when mustard is in bloom. When the mustard is not in bloom, they may require other sources of flowers, places to nest and protected habitats.FAO suggests a series of practical pollinator-friendly practices, such as preserving wild habitats, flower-rich field margins and buffer strips, conserving nesting sites and reducing risks from pesticides.

Pollinator-safe pest management

This may be the essence of integrated pollinator management.Mustard is affected by insect pests especially mustard aphid and other damaging insects. Farmers have a legitimate interest in protecting their crops.The problem is insecticides are used without any thought as to what else is in the field.During flowering the crop may contain at the same time- pests, natural

enemies, wild bees, other flower visitors, honey bees. Broad spectrum insecticides can reduce the pest population, but they may also affect pollinators when they are applied at the wrong time or in an unsafe manner. A review on Integrated Pest and Pollinator Management (IPPM) highlighted that conventional pest management often ignores pollinator welfare and called for more selective, judicious pest-management strategies.

Better crop and flowering-period management

The most sensitive period is flowering for pollination management. During this period, farmers should closely monitor: bee activity, flowering intensity, pest pressure, weather conditions and the need for any plant protection measures. A useful principle is: **When flowers are busy with pollination, spray decisions need to be more careful.** The object is to avoid unnecessary disturbance during the time when pollination is actively contributing to the formation of the pods.Farmers can also review the field at different times of the day. Mustard studies have shown that the activity of pollinators as they forage varies with the weather and time of day. Bee abundance and activity can be influenced by temperature and relative humidity.Hence, pollination management should be conducted on the basis of field observation and not on a fixed calendar.

Challenges and the Way Forward

Mustard has clear potential for pollination, but its management is still under used. Many farmers know bees exist, but may not automatically connect bee activity with how well crops produce. In some places access to controlled colonies is also limited. But wild pollinator populations may decline because of careless pesticide use and habitat degradation.More collaboration between farmers, agronomists, entomologists, beekeepers and extension agents is needed in the future.Further location-specific research is also needed. However, the best management of pollinators for one region where mustard is grown may not be exactly the same for another due to differences in climate and surrounding vegetation and pollinator diversity.Recent work on mustard and stingless bees is particularly encouraging as it allows to identify and use regionally adapted pollinators more successfully.

Conclusion

Pollination is simple but often ignored although it can make a real difference in mustard yields. Bees and other pollinators buzz from flower to flower, quietly helping crops grow by spreading pollen, forming pods, and letting seeds develop. Often overlooked in regular farming, these little bugs can actually give you a bigger harvest.We shouldn't just keep adding more bee colonies to every field or give up pest control altogether. Integrated Pollinator Management is about finding the right balance: using managed bees when helpful, without harming native pollinators. Preserving natural habitats and using smart, focused pest control lets you protect your crops without harming beneficial insects.Research on mustard shows that crops with plenty of pollinator visits tend to thrive more than those without them. The difference in yield between open-pollinated and pollinator-excluded crops suggests that poor pollination may be silently cutting into farmers' harvests. In this way, pollinators serve as a natural, often overlooked helper in mustard fields.

References

1. Adit, S., et al. (2024). Pollination research in India: Current status, future vision and conservation implications. *Integrative Conservation, 3,* e74. https://doi.org/10.1002/inc3.74
2. Bijarniya, M., Yadav, A. S., & Jangir, N. (2024). Studies on insect pollinator fauna and behaviour of honeybees in Indian mustard (*Brassica juncea* [L.] Czern. and Coss). *Journal of the Entomological Research Society, 26*(1). https://doi.org/10.51963/jers.v26i1.2483
3. Chauhan, D. S., Negi, G. C. S., & Joshi, R. (2024). Effect of honey bee (*Apis cerana*) dominated insect pollination on yield and quality of mustard, buckwheat and plum in

Central Himalayan agro-ecosystem. *International Journal of Ecology and Environmental Sciences, 50*(4), 543–556.

4. Food and Agriculture Organization of the United Nations. (n.d.-a). *How to manage pollination*. FAO.
5. Food and Agriculture Organization of the United Nations. (n.d.-b). *Pollinator management*. FAO.
6. Indian Council of Agricultural Research. (2011). *Annual report 2010–11: Crop improvement*. ICAR.
7. Layek, U., Bhandari, T., & Karmakar, P. (2026). Flower visitors and pollinator interactions on mustard (*Brassica juncea*): Yield increase potential of stingless bees (*Tetragonulapagdeni*) across field systems. *Scientific Reports*. https://doi.org/10.1038/s41598-026-54297-3
8. Maity, A., Chakrabarty, S. K., & Yadav, J. B. (2014). Foraging behaviour of honeybees (*Apis* spp.) (Hymenoptera: Apidae) in hybrid seed production of Indian mustard (*Brassica juncea*). *The Indian Journal of Agricultural Sciences, 84*(11). https://doi.org/10.56093/ijas.v84i11.44646
9. Mukhtar, Y., & Shankar, U. (2023). Integrated pest and pollinator management in India: A way forward to sustainable agriculture. *The Indian Journal of Agricultural Sciences, 93*(9), 939–947. https://doi.org/10.56093/ijas.v93i9.134403
10. Nagpal, K., Yadav, S., Kumar, Y., & Singh, R. (2026). Effect of pollination modes on yield components in Indian mustard (*Brassica juncea* L.). *Journal of Oilseed Brassica, 8*(2), 187–194.