The Green Revolution of the late 1950s marked the advancement of agriculture technology and the development of high-yield crops became a priority in agriculture. In tropical Asia, the Green Revolution helped farmers to solve the problem of the brown planthopper (BPH), an insect pest that devastates rice crops. Prior to the Green Revolution the population density of the brown planthopper was naturally regulated by a variety of native predators, including spiders and insects. Although the development of rice cultivars and GMOS, synthetic fertilizers, and synthetic pesticides advertised increased production, farmers are facing larger problems than ever before. In fact, the end result was that an initial strategy to increase rice yields and avert crop failure has had the exact opposite effect.

The use of high-yield rice varieties, fertilizers, and pesticides has altered the natural balance of predator-herbivore-plant interactions that regulated the densities of the populations of BPH and its predators. When pesticides are sprayed, not only will the BHP be affected, but many pesticides are non-discriminatory and will kill a plethora of organisms, including those that naturally prey upon BPH. In the short term, pesticides will lower the magnitude of BPH but the lack of predators causes a resurgence of BPH that now lack pressure from the environment (Figure 1). Many research studies investigate the role of a pesticide in killing the target pest, but not the predators found in that area. However, Figure 2 highlights the research of one group of scientists who studied 11 different pesticides and how lethal they are to both BPH and one of their predators, the insect mirid.

**Figure 1:** BPH population density in pesticide sprayed and unsprayed rice fields. The days after transplanting are based on when BPH were first introduced into the fields.



**Figure 2:** The LC90 (lethal concentration required to kill 90% of the population) of 11 different chemical pesticides on BPH and their predator mirids. The purple bars are the recommended concentration given by the manufacturers of the pesticides.

**Discussion Questions**

1. Looking at Figure 1, what are the differences between the treated and untreated plants? What is the explanation for this trend?
2. In Figure 2, which pesticide(s) and in what amount would you recommend to farmers? Why would you make this recommendation?
3. The pesticide companies create the recommendations for how much farmers should use on their crops. Were there any recommendations that were higher than needed? How many? Why might a company do this?
4. Identify any words, topics, acronyms, etc. that you did not know or understand from the introduction. In addition, use the space below to write **one** question that relates to the information presented.

**References**

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