

Abstract

The pollution levels caused by pesticide residues in crops and water bodies have reached alarming proportions in recent years. Acephate, for instance, is a highly water-soluble and foliar spray insecticide whose usage in vegetables and khat plants has gained wide acceptance since it has broad target spectrum, short residue period and low poisonous risk to humans. The toxic nature of acephate has prompted its partial restriction in some countries across the world. Accordingly, chemical-based degradation methods have been proposed to mitigate its aetiological risks by decontaminating polluted areas, although their application has not been successful since the remediation strategies are too expensive. Herein, the mechanistic degradation channels of acephate into low-toxic and non-toxic forms are explored. In addition, the mechanism for the mode of action and resistance of acephate in insects and the toxic effects of these insecticides are critically discussed. Degrading microorganisms such as bacteria, yeasts, fungi, actinomycetes and enzymes obtained through culture enrichment technologies have been found to isolate and promote pesticidal degradation by utilising specific pesticides as their source of phosphorus, nitrogen and carbon for their growth. Here, we also reviewed the alternative microbial degradation channels of acephate approach which has emerged as a cheap, effective, and environmentally friendly method that can be used on large-scale decontamination. In these process, bacteria, fungi, yeasts, actinomycetes and enzyme microorganisms can be used as degrading agents since they have superior and better degrading abilities. This work, therefore, recommends the use of multiple compatible microorganisms for efficient bio-remediation and pollutant removal abilities. The study has also evaluated food-washing preparation techniques applicable to many households as preference for the potential elimination of acephate residues, where washing acephate-sprayed crops, khat leaves and vegetables using clean running water for an extended period of time are strongly recommended.