Introduction

India is an agriculture-based country where insecticides are commonly used for crop pest management. Extensive use of these insecticides to protect the crops has increased their level in soil and water bodies. Persistence of the insecticide residues in the soil is a global problem. Insecticides cause harmful effects on soil micro flora and crop plants. They are not easily degradable and cause adverse effects on plant growth through the process of bioaccumulation. More than 500 different formulations of pesticides have been used in the environment, largely in agricultural activities, for many decades. Pesticides are widely studied as environmental contaminants because of their extensive use in the control of pests affecting agricultural crops, homes, and gardens. Because of their chemical characteristics, they represent a type of pollutant that shows variable persistence and biochemical and photochemical degradation (Bandala et al., 2007). Approximately 90% of agricultural pesticide application never reaches its target organisms but is, instead, dispersed through the air, soil, and water. As a result, they are routinely detected in air, surface and ground water, sediment, soil, vegetable, and to some extent in foods. In addition, many soil-applied pesticides are also intentionally introduced into the soil environment for the control of soil borne pests and pathogens, which results in the accumulation of their residues and metabolites in soil at unacceptably high levels (Shalaby and Abdou, 2010). This group of substances can be classified according to the purpose for which they are intended, the mode or period of action, or the chemical function such as: insecticide (insects), fungicide (fungi), rodenticide (rodents), moluscicide (snails), defoliant (leaf harvesting), dissecting (foliage). Although there are benefits associated with pesticide mixtures, potential problems need to consider when two or more pesticides are mixed together. These include plant injury (phytotoxicity), pesticide incompatibility and antagonism (Cloyd, 2001). Antagonism occurs when mixing two or more pesticides together results in reduced efficacy (based on percent mortality) compared to separate applications of each pesticide or when the combined toxicity of two materials when applied together is less than the sum of the toxicities of the materials when applied separately (Lindquist, 2002).
Organophosphate insecticides have become the most widely used insecticides available today. More than forty of them are currently registered for use and all run the risk of acute and subacute toxicity. They are used in agriculture, in the home, in gardens, and in veterinary practice. Organophosphates poison insects and mammals primarily by phosphorylation of the acetylcholinesterase enzyme (AChE) at nerve endings. This result in a loss of available AChE so that the effector organ becomes overstimulated by the excess acetylcholine (ACh, the impulse-transmitting substance) in the nerve ending. Humans exposed to insecticides and their additives shows severe stomach lesions, characterized by inflammation, hyperplasia, necrosis, ulceration due to disruption of endocrine system (US EPA, 2006).

The insecticide alone is not capable of controlling the insects but the additives which are added in commercial production of insecticide is responsible for adhesion, biotransformation and shows toxicity to the insects. A large amount of the active ingredient often does not actually reach its intended target so they require additives to compensate the time required before the main action of insecticide begins. These insecticides and their transformation products, plus residues from insecticides that actually reach the target are subsequently transported to the environment and are responsible for bioaccumulation in plants, ground water and surface water contamination. The use of insecticides is common in agriculture field so as to control the insects from controlling the damage to crop plants.

Organophosphorous insecticide additive like tallowamine ethoxylate and Neonicotinoid insecticide additives like Mercaptobenzothiazolyl-(Z)-(2-aminothiazol-4-yl) -2 - (tert-butoxycarbonyl) isoproopy iminoaceetaetate and benzyl benzoate derivatives are well studied with respect to their toxic effect not only to the pests but also to other living forms in an environment including humans. The influence of such compound in suppressing the growth and distribution of the certain species is considered to be extremely common. It is therefore very essential to give due importance to this issue. The biodegradation of these
insecticide additives is an alternative as it is cost effective compared to chemical methods of detoxification. Moreover there is no secondary pollution and hence it is beneficial from community health point of view.

Biodegradation is the general term used for biological breakdown of chemical compounds. The complete breakdown of these compounds leads to mineralization of the compounds. Microorganisms play an important role in biodegradation of environmentally hazardous compounds. Various organopollutants are recalcitrant in the nature including hydrocarbons, pesticides and plasticizers etc. that remain in the environment for longer time without being degraded (Ike et al., 2002). Microbes have catabolic diversity to degrade, transform or accumulate a large range of compounds. The general approaches to bioremediation are to enhance natural biodegradation by native organisms (intrinsic bioremediation), to carry out environmental modification. Biodegradation or Bioremediation are the cost effective techniques to achieve ecotoxic free practices. Bioremediation of a contaminated site typically works in one of two ways - by enhancing the growth of whatever pollution eating microbes living at the contaminated site and specialized microbes are added to degrade the contaminants (Scow and Hicks, 2005). Large deposition of insecticide additives in agriculture farm yard results in the infertility of soil. The deteriorating health of soils and plants has therefore, drawn the attention of researchers as to how the soil fertility and associated activities of microorganisms can be protected. Some soil microorganisms ultimately account for the degradation of the insecticides and their additives. Genus Pseudomonas is Gram negative, aerobic or facultative anaerobe, non sporulating, motile, rod shaped bacteria. While a few species are pathogenic, most are found to thrive in broad environments including soil, water and polluted industrial area. Pseudomonas desmolyticum NCIM 2112 is important due to its ability to catabolize a wide range of compounds including insecticide additives. Soil factors such as moisture, temperature, pH and organic matter content are known to greatly influence the microbial breakdown of the insecticide additives. Therefore study should be undertaken to understand such factors.