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The Paramount Benefits of Using Insecticides and Their Worldwide Importance in Food Production

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Abstract

Various types of insecticides and treatment methods are available depending upon the attributes required in the particular application and the level of crop protection needed. Preferably, an insecticide must be deadly to the targeted pests, however not to non-target species, together with man, livestock and pets. Regrettably, this is not the case, thus the disagreement of usage and mishandling of insecticides has been raised. This study is carried out to identify and characterize the various types of benefits to support insecticides by focusing on the other neglected side of the coin, in which pests management chemicals make a positive and often essential contribution to crop protection. Among these, organochlorine insecticides have been used successfully in controlling a number of harmful insects, and after the technologically advanced the introduction of other synthetic insecticides like organophosphate, carbamate and pyrethroid, further contributed greatly to pest control needs and enhancement of agricultural output. Crop protection technologies allow producers to increase crop yields and efficiency of food production processes. Plant protection chemicals that reduce and eliminate insect damage allow the consumers to purchase high-quality products free of insect fragments. Without crop protection chemicals, food production would decline, many fruits and vegetables would be in short supply and prices would rise. Helping to keep food prices in check for the consumers is another large benefit of insecticides. Insecticides are the most effective substances to eliminate insects that cause human diseases such as malaria, dengue fever and typhus fever. Also, human health is supported against insect and fungi borne carcinogens, like aflatoxins, which is proceeding to hepatic and other cancers. Other positive aspects of crop protection chemicals on responsible and safe use include household pest control, pest control on vegetation in industry, infrastructure and recreation sites, and protection of areas against pests like wild animals, which cause land degradation. Insecticides will continue to be the main component of integrated pest management programs on plants for the predictable forthcoming periods. Simply, there are no other pest management tactics that may totally replace pesticides at this moment. The finding from the study is that the list of beneficial outcomes from sensible use of pesticides is long and provides compelling evidence that insecticides might continue to be a vital tool in the diverse range of technologies that can maintain and improve plants health to further improve living standards of the peoples around the world.

Keywords

Pesticide, Food Quality, Environment, Crop Protection, Insect Control

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1. Introduction

Insects form the largest class of the animal kingdom and include nearly 80% of known animal species. Among them, ten out of thousands of species are considered as high risk species for man. These pests have a double impact on human, 1) medical; insects are pathogenic agents or disease vectors for men and domestic animals, and 2) agricultural; they devastate crops. Phytophagous insects damage rice crop

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(58% losses), cotton (47%), cause the loss of more than a third of corn and sugar-cane crops, and nearly a fifth of wheat (Riba and Silvy, 1989; Khalid et al., 2015). Insect control constitutes a major and ancient preoccupation of human beings. Most peoples eat food grown in a system that uses pesticides and many individuals use pesticides in the house or garden. In places where there are insects whose bites can be a nuisance or a hazard, insecticides are used to make life safer or more comfortable. For tackling pest's problems, this study on the benefits of pesticides is an iterative process. Some of the benefits, such as the reduced mortality from malaria achieved by controlling Anopheline mosquitoes, are obvious and it is needed to know further searching from the literature. However, the initial searches provide leads to different benefits owing to the use of insecticides. Some of others are less obvious due to the being secondary benefits arising either in the medium or long term, or being subtle or small incremental benefits distributed over a very wide area. However, these secondary benefits are equally important and in some cases provide the ultimate justification for the use of the insecticides (Cooper and Dobson, 2007). Ideally, a pesticide must be lethal to the targeted pests, but not to non-target species including man. Unfortunately, this is not the case, so the controversy of use and abuse of pesticides has been appeared. The incredible paybacks have been derivative from the usage of pesticides in agriculture. Moreover, considerable economic losses might be resulted without pesticides usage and the spectacular increases in crop yields from use (Warren, 1998). With the intention to inform a more balanced view, this study is carried out to identify and characterize the various types of reimbursements and where possible reporting of publications to support them.

2. Primary and Secondary Benefits of Insecticides

Tremendous benefits have been derived from the use of insecticides in in agriculture, forestry, public health and the domestic sectors, of course upon which the economy of a state is largely reliant. Correspondingly, outputs and productivity have increased dramatically in most countries, which have been due to several factors including use of fertilizer, better crop varieties, and use of farm machinery and chemicals. Insecticides have been an essential part of the process to reduce losses from the insect pests and diseases they vectored that can markedly reduce the amount of harvestable produce. Primary benefits are the direct gained effects expected from the use consequences of the insecticides, for instance the influences of killing the larvae or caterpillars feeding on the plant bring the primary benefit of higher yields and better quality of produce. The main effects resulting from primary benefits range from protection of pest and vectored disease, control of human vectors and vector-borne diseases, and pet diseases and vector's nescience to save lives. Secondary benefits are the fewer speedy or less noticeable benefits that are outcomes of the primary benefits and these may be indirect, less instinctively apparent, or of longer term. For instance the higher crop yields might fetch extra income that could be put towards medical cares or younger's education leading to a healthier and better educated person. The secondary welfares identified are ranging from community, country and to global welfares of the peoples. It monitors that the secondary benefits are therefore powerful justifications for insecticide usage. The secondary benefits are the less immediate or less obvious benefits that result from the primary benefits (Sarwar, 2015 a; 2015 b; 2015 c). Webster et al., (1999) has stated that 'considerable economic losses' would be suffered without pesticide use and quantified the significant increases in yield and economic margin that result from pesticide use. Moreover, in the environment most pesticides undergo phytochemical transformation to produce metabolites which are relatively non-toxic to both human beings and the environment (Kole et al., 1999). The numerous studies carried out to identify and characterize the various benefits to support insecticides in pest management for crop protection are outlined underneath (Aktar et al., 2009; Saravi and Shokrzadeh, 2011):-

2.1. Vector-Borne Disease Control

Vector-borne diseases are most effectively tackled by killing of the vectors and insecticides are often the only practical way to control the insects that spread deadly diseases such as malaria, resulting in an estimated 5000 deaths each day. It has been written that malaria is one of the leading causes of morbidity and mortality in the developing world and a major public health problem in humans. Disease control strategies are crucially important also for livestock or pet (Ross, 2005).

2.2. Quality of Food

In countries of the world, a diet containing fresh fruits and vegetables far outweigh potential risks from eating very low residues of pesticides in crops. Increasing evidence shows that eating fruits and vegetables regularly reduces the risk of many cancers, high blood pressure, heart disease, diabetes, stroke and other chronic diseases (Sarwar et al., 2013; 2015 a; Sarwar et al., 2013; 2014; 2015 a; 2015 b; 2015 c; Sarwar, 2015 d; 2015 e; 2015 f; 2015 g; 2015 h; Mughal et al., 2015). Lewis et al., (2005) attributed doubling in wild blueberry production and subsequent increases in consumption chiefly

to herbicide use that improved weed control.

2.3. Sport Complex and Building

Herbicides and insecticides are used to maintain the grass on playing fields, sports pitches, cricket grounds and golf courses. Insecticides protect buildings and other wooden structures from damage by termites and wood boring insects.

2.4. Increase Food Production

Crop protection technologies allow the producers to increase crop yields and efficiency of food production processes. Up to 40 percent of the world's potential crop production is already lost annually because of the effects of weeds, pests and diseases. These crop losses would be doubled if existing pesticide uses are abandoned.

2.5. Decrease the Cost of Food

Because the use of insecticides improves crop yields, so crop protection technologies also impact the cost of food. Without crop protection chemicals, food production would decline, many fruits and vegetables would be in short supply and prices would rise. Helping to keep food prices in check for the consumers is another large benefit of insecticide applications.

2.6. Consumer Benefits

Insecticides allow consumers to consume high-quality produce that is free of insect blemishes and insect contamination. Crop protection chemicals that reduce and in some cases, eliminate insect damage allow the consumers to purchase high-quality produce free of insect fragments or excreta.

2.7. Household Pests Control

Insecticide products are used to control termites, roaches, ants, rats and other pests to reduce annoyances and commodity contamination.

2.8. Industry and Infrastructure

Pesticides are used to control vegetation that clogs navigable and other waterways or threatens to obstruct highway, utility and railroad ways.

2.9. Recreation Areas

Pesticides are used to protect and enhance lawns, gardens, public parks, lakes and ponds for public enjoyment.

2.10. Crop Protection Technology

Crop protection technology which includes all pesticides, herbicides, insecticides as well as fungicides help to control the thousands of weed species, harmful insects and numerous plant diseases that afflict crops. Without these important crop protection and pest control technologies, food production would decline, many fruits and vegetables would be in short supply, and the farmers would lose their harvests.

2.11. Affordable Prices

Insecticides are an important part of making sure that publics have access to an abundant supply of safe and healthy foods, fruits and vegetables at affordable prices. In this way, both farmers and consumers get benefits from the use of crop protection products.

2.12. Human Health

Many agricultural commodities are vulnerable to attack by aflatoxins and insect control is necessary to prevent the passage from insect to food or plant. Aflatoxins, are carcinogen, can cause liver and other cancers in humans, lower the body’s normal immune response, and can impair growth in children. Crop protection chemicals are used to control insect damage that leads to aflatoxin contamination specifically in food grains (Sarwar et al., 2015 b; Khalid et al., 2015).

3. Need of Farm Chemicals

Farm chemicals are important because they enable us to produce sufficient high quality and wholesome food for a growing population. They also allow efficient and economic pest control and often there is no alternative control option. Civilization has been combating weeds, insects, diseases and other pests throughout history and there are many examples of how these pests have exerted major impacts on humans. One of the worst examples is the black plague of Europe in the fourteenth century when millions of humans died from a bacterial disease spread by fleas from rats host. Another example is the infamous Irish potato famine of the nineteenth century in which millions of persons died and many more have been forced to emigrate. A fungus also destroyed the entire German potato crop in the early twentieth century resulting in 700,000 deaths from starvation. In this course, economically advanced countries have plenty of good wholesome food due to a scientific approach to agriculture, which includes the use of pesticides. Without the use of farm chemicals, the production and quality of food would be severely jeopardized with estimates that food supplies would immediately fall to 30 to 40% due to the ravages of pests. There is a limit to new areas to cultivate; therefore someone must increase agricultural production from the areas available. While there may be some nervousness about the misuse of pesticides, there would be even more concern if there are no means of combating insects such as carrier of

plague, or locusts which can eat tones of green plants in a day (Kent, 1991; Stephens and Harris, 1992).

4. Advantages of Using Pesticides

Basically, pests are an ecological problem and therefore our control strategies must be ecologically sound. Modern agriculture is a combination of both crop production and protection, and human intervention is necessary whether it be pulling out weeds by hand, use of pesticides or genetic engineering. Control methods continue to evolve over time as knowledge and techniques are improved. This includes the development of chemical means of control which become very important because of a number of advantages. For example:-

4.1. Cost Effectiveness

Farm chemicals are an economical way of controlling pests, which require low labour input and allow large areas to be treated quickly and efficiently. It has been conservatively estimated that for every penny a farmer spends on farm chemicals he may receive four times return. Production per labour unit has increased while production costs and energy inputs are lower.

4.2. Timeliness and Flexibility

A suitable farm chemical is available for most pest problems with variations in activity, selectivity and persistence. The best product can be chosen for the situation and this allows more flexibility in management options and better timeliness of pest control.

4.3. Quality, Quantity and Price of Produce

Farm chemicals ensure a plentiful supply and variety of high quality, wholesome food at a reasonable expense. Modern society demands nutritious food free from harmful organisms and blemishes. Ornamental horticulture also requires unblemished and pest-free plants and flowers, which would be very difficult without use of farm chemicals.

4.4. Prevention of Problems

Farm chemicals are frequently used to prevent pest problems from occurring e.g., preventing weeds in gardens and lawns, treatment of export and import produce to prevent the spread of pests, treatment of stored products to prevent pest's attack and destruction during storage.

4.5. Protection of Pets and Humans

Without farm chemicals, the treatment of spiders, mites, cockroaches in houses, while fleas on pets, lice and ticks on livestock and on poultry would be most difficult.

4.6. Protection of the Environment

Farm chemicals are a management tool to aid in the control of pests and their continued use is supported by the conclusions of the state on agriculture and veterinary. If no farm chemicals are available to control environmental pests like noxious weeds, feral animals, and environment insects, our atmosphere would suffer very badly. Using herbicides to control crop weeds reduces the need for cultivation, thus reducing land degradation.

4.7. Better Harvests

Global production of major crops has increased significantly due to large part to plant science innovations like pest control products, but with the world's population rapidly increasing, and the amount of land available for agricultural production decreasing, it is becoming increasingly important for farmers to be able to sustainably maximize the amount of food they are able to grow on the land that is currently being used for agriculture. Increased production also means consumers save money at the grocery store. Today, modern tools like pesticides help to prevent yield losses and aid to keep food prices low. In fact, thank is payable to plant biotechnology and pest control products, as consumers save much percent on their weekly grocery bills. Farmers use pesticides to control weeds, diseases and insects that threaten to decrease their harvest dramatically, otherwise food production would fall by some per cent without pest control products.

4.8. Supplying Safe and Healthy Foods

In fact, using innovative technologies like pesticides, farmers produce an abundant supply of the essential foods, so consumers can rest assured that the produce they pick up at the grocery store is safe. The regulatory system should ensure that whether food is produced using modern technologies like pest control products or through other methods, it is safe for consumption.

4.9. Protecting Biodiversity

Pesticides are an important part of significantly increasing food production. The ability to improve farm yields means farmers can produce more food to meet the current needs without expanding their land base. This in turn protects biodiversity, wildlife habitats, forests, wetlands and grasslands that are left untouched by agricultural production, in the better way. Pesticides can also play an important role in protecting food crops as well as forests and other wildlife habitats from invasive species and non-native insects and other pests.

5. Maximizing Benefits of Farm Chemicals

We must aim to maximize the advantages and benefits of farm chemicals while minimizing potential problems. This can be achieved in three ways like by ensuring that there are adequate safeguards over the manufacture, sale and use of these products; ensuring farm chemicals are only used with an integrated pest management (IPM) approach; and ensuring farm chemicals are used correctly, safely and accurately by well trained and competent applicators. Each of these categories is considered turn by turn:-

5.1. Safeguards

In most of the nations there are very stringent controls and regulations governing all aspects of farm chemicals, including development and testing, registration, transport, storage and sale, use, residues in food, disposal of waste, and environmental contamination. Any insecticide must be registered with government authorities before sale, and to gain registration, all public health, occupational health, environmental and agricultural concerns must be satisfied. As well as stringent controls over the development and sale of pesticides, there is also strict regulation of their use. This regulatory system is aimed to protect human and environmental safety, ensure product effectiveness thereby avoiding unnecessary chemical use, and to safeguard export trade by ensuring that our produce is free of pests and also free of unwanted chemical residues. To back up this comprehensive legislation, government authorities must monitor pesticide use through inspectors and continual testing of produce for illegal residues. With these levels of control, public can be confident that commercial farm chemicals are effective and can be used with minimum adverse effects, and our food is free of undesirable residues provided the chemicals are applied correctly and adhered to the directions on the label. In fact, pesticides are tested to the same levels as human medicines and this is an area to which the organic farming movement needs to urgently address.

5.2. Operator Competency

Competency is a combination of knowledge, skills and attitude. Farm chemical users need to know what they are doing and have a sound knowledge of the products they are using. They then need to have the skills to ensure that this knowledge is used to best advantage, while the correct caring attitude is necessary to safeguard themselves, their families and the community. Such competency can best be achieved through training and accreditation in national industry training programs. Both of these programs have been introduced by the industry or farming sector and they are aimed at ensuring a thorough understanding of legislative requirements, the correct use of farm chemicals and a high level of competency in the industry or farming.

5.3. Correct Use of Pesticides

It is essential that pesticides are not used as the sole means of pest control and their misuse, overuse and abuse leads to many of the problems. In other words, using pesticides as part of an organic farming system is the only way to economically and ecologically sustainable farming. When pesticides are used, it is vital that they are used correctly and some of the considerations involved are selection of product, compatibility with other controls, safe work practices, following label directions, timing of application, accurate application to the target, selection, adjustment and calibration of equipment, application under favourable weather conditions, and keeping of good records. By correct, safe and accurate use of these products, better pest control can result, adverse effects will be minimized, and farming might be more profitable.

6. Alternatives to Traditional Pesticides

Some evidence shows that alternatives to pesticides can be equally effective as the use of chemicals. The experiences resulted from some countries used alternatives emphasize that education of pesticide use, application of composted yard waste with high carbon to nitrogen ratio to agricultural fields, etc., are highly effective at increasing of crop yield. As a result, today's pesticides and alternative methods are safer and more effective in controlling pests than ever before in our history (Saravi and Shokrzadeh, 2011).

7. Conclusion

Agricultural and veterinary chemicals are vital to our welfare and the protection of the health of our families, livestock and pets. The use of insecticides can prevent or reduce agricultural losses by pests and so improves yield, as well as refining the quality of the produce. These can also improve the nutritional value of food and sometimes its safety. In our free living society, there is a place for peoples to grow and consume organic food, but if all our farmers decided against using farm chemicals, someone would soon find themselves in a grave situation. Unless and until, better more efficient and more cost effective means of pest control are developed, farm chemicals will remain a major weapon in our constant battle against pests. These are an integral component of agricultural systems and agriculture today could not survive without them. Without chemicals, production would drop

drastically, food would be of poorer quality, more expensive and in short supply. Moreover, many pets and farm animals would suffer and die needlessly. Additionally, the national economy and our standard of living would rapidly decline. The main effects of farm chemicals uses are controlling of agricultural pests including diseases and vectors of plant diseases, controlling human or livestock disease vectors and nuisance organisms, and preventing or controlling organisms that harm other human activities and structures. All persons concerned with the manufacture, distribution and use of farm chemicals must ensure that these products are used to attain maximum advantages. This can be achieved by ensuring that farm chemicals are used accurately and correctly. These must be used in conjunction with other pest control techniques as a part of an integrated pest management approach. This is the only way that agriculture can be environmentally, economically and socially sustainable. Operators must be competent and well trained, and all users must be environmentally aware of consequences. By combining these principles with the long established regulatory safeguards, someone can be confident that farm chemicals are effective and can be used safely. Public can also be reassured that our food is safe, wholesome and of high quality at reasonable cost.

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