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BIOPESTICIDES

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ABSTRACT

Pests and conditions are responsible for almost of the losses related to agrarian crops, either in the field or in storehouse. also, due to magpie use of synthetic fungicides over the times, several issues have come on, similar as pest resistance and impurity of important earth sources, similar as water, air and soil. thus, in order to amelio rate effectiveness of crop product and reduce food extremity in a s ustainable manner, while conserving consumer's health, factory-deduced fungicides may be a green volition to synthetic bones. T hey're cheap, biodegradable, ecofriendly and act by several mechan isms of action in a more specific way, suggesting that they're lower of a hazard to humans and the terrain. Natural factory products with bioactivity toward insects include several classes of motes, for illustration terpenes, flavonoids, alka loids, polyphenols, cyanogenic glucosides, quinones, amides, aldehydes, thiophenes, ami no acids, saccharides and polyketides (which isn't an total list of insecticidal substances). In general, those composites have important ecological conditioning in nature, similar as antifeedant, attractant, nematicide, germicide, repellent, germicide, nonentity growth co ntroller and allelopathic agents, acting as a promising source for new pest control agents or biopesticides. still, several factors appear to limit their commercialization. In this cr itical review, a compendium of factory- deduced metabolites, along with their correspo nding toxicology and mechanisms of action, will be approached, as well as the different strategies developed in order to meet the needed commercial norms through more effect ive styles.

1 INTRODUCTION

1 1 Pest

Pest is any animal, plant or microorganism that causes trouble, injuries (Economic da mage) or destruction to plants or crops Humans have modified the terrain for their own purposes and are intolerant of other brutes enwrapping the same space when their conditio ning impact negatively on mortal objects. therefore, a giant is unobjectionable in its nat ural niche but a pest when it tramples crops. Carpet beetle naiads damaging a instance of Sceliphron destillatorius in an entomological collection Some creatures are disliked because they suck or sting; snakes, wasps, ants, bed bugs, fleas and ticks belong in this o rder. Others enter the home; these include houseflies, which land on and pollute food, beetles, which lair into the woodwork, and other creatures that scuttle about on the botto m at night, like cockroaches, which are frequently associated with unsanitary conditions. Agrarian and horticultural crops are attacked by a wide variety of pests, the most importa nt being insects, diminutives, nematodes, and gastropod molluscs. The damage they do results both from the direct injury they beget to the shops and from the circular co nsequences of the fungal, bacterial, or viral infections they transmit. shops have their own defences against these attacks, but these may be overwhelmed, especially in territo ries where the shops are formerly stressed, or where the pests have been accidentally introduced and may have no natural adversaries. The pests affecting trees are generally insects, and numerous of these have also been introduced inadvertently and warrant nat ural adversaries, and some have transmitted new fungal conditions with ruinous results.

The common pests: - Insects, bacteria, fungi, rats (rodents) and weeds.

1 . 1 . 1 Definition

A pest is a living organism, be it a plant, fungus, or animal this is dangerous to and threate ns the lifestyles and life of people and human concerns, livestock, crops, and forestry. A lso, the time period is broadly used to consult living organisms that wreak havoc, as a n instance at home, workplaces, and food storage facilities.

1.1.2 Types ofpests

1. Fungi

Primaryhost aphids, leafhoppers, flies, beetles, mites, and thrips.

Some insect species, along with many pests, are specially at risk of contamination wit h the aid of using certainly occurring, insect- pathogenic fungi. These fungi are very un

ique to bugs, regularly to specific species, and do now no longer infect animals or plants. Fungal boom is desired with the aid of using wet situations however fungi additiona lly have resistant levels that keep contamination ability below dry situations. Fungi have sizable epizootic ability and may unfold quick thru an insect populace and reason its col lapse. Because fungi penetrate the insect body, they are able to infect sucking bugs wh ich includes aphids and whiteflies that aren't at risk of micro-organism and viruses.

Crops

Most plants along with soybeans, greenhouse plants, vegetables, cotton, citrus, and or namentals; additionally, indoors plants capes and forests. An aquatic fungus infects mosq uito larvae of a few genera.[1]

Most insect pests are liable to fungal pathogens. Some fungi, which includes the *Entomophthora* and associated species, are pretty precise with reference to the organizat ions of bugs affected; others, which includes *Beauveria*, have a much wider host range.

Rust: This fungal disorder earned its call from the rust-orange pustules that shape at t he undersides of leaves. The fungus grows and spreads, top leaf surfaces discolor, and leaves finally fall from the plant. Cool, wet climate and moist foliage fuels rust because it spreads with the assist of wind, water and unwitting insects.[2]

Figure-1: Rust.

Fungi invade bugs with the aid of using penetrating their cuticle or "skin." Once wit hin the insect, the fungus swiftly multiplies for the duration of the frame. Death is d ue to tissue destruction and, occasionally, with the aid of using pollutants produced wit h the aid of using the fungus. The fungus regularly emerges from the insect's frame to p rovide spores that, while unfold with the aid of using wind, rain, or touch with different bugs, can unfold infection.

2. Virus

Baculoviruses are specific to individual insect host species and have been show to be useful biological pest control. For example, the Lymantria dispar multi capsid nuclear polyhedrosis virus has been used to spray large areas of forest in North America where la rvae of the spongy moth are causing serious defoliation.

The moth larvae are killed by the virus they have eaten and die, the disintegrating cadave rs leaving virus particles on the foliage to infect other larvae.

A mammalian virus, the rabbit haemorrhagic disease virus was introduced to Australia to attempt to control the European rabbit populations there. It escaped from quarantine and s pread across the country, killing large numbers of rabbits.

Very young animals survived, passing immunity to their offspring in due course and eve ntually produceing a virus-resistant population. Introduction into New Zealand in t he1990s was similarly successful at first, but a decade later, immunity had developed, a nd populations had returned to pre-RHD levels.

3. Insects

Vertebrates- Rodents:-Rodentia is an order of mammals additionally called rodents, c haracterised with the aid of using constantly developing incisors (the front enamel), at the higher and decrease jaws respectively, which need to be saved quick with the aid of using gnawing. This is the starting place of the name, from the Latin phrase rodere, because of this that to gnaw. These enamels are used for slicing wood, biting thru the pores and ski n of fruit, or for defense. The enamel has tooth at the outdoor and uncovered dentine at t he inside, so that they self-sharpen at some point of gnawing. Rodents lack canines, and feature a area among their incisors and pre molars.

Forty percentage of mammal species world-huge are rodents (round 2,277 species). T hey are observed in massive numbers gift almost on all continents and islands, and in all habitats besides oceans and Antarctica. Their fulfillment might be because of their small s ize, quick breeding cycle, and capacity to gnaw and feed on a huge sort of foods.

Rodents are essential in lots of ecosystems due to the fact they reproduce rapidly, and m ight characteristic as meals reassets for predators, mechanisms for seed dispersal, and as

disorder vectors. Humans use rodents as a supply of fur, as pets, as version organisms in animal testing, for meals, or even for detecting landmines.

In the Maltese Islands 4 species of rodents are recognized to occur. These are divided in 2 species of rats and a couple of species of mice. Rats are usually outstanding from m ice with the aid of using their size; rats are commonly huge rodents, whilst mice are s maller. The best- recognized rat species (and those are what we've in our islands) are t he Black Rat (Rattus rattus) and the Brown Rat (Rattus norvegicus). The institution is commonly called the Old-World rats or actual rats and originated in Asia. Rats are larger than maximum Old-World mice, that are their relatives, however, seldom weigh over 500 grams withinside the wild. Male rats are commonly known as bucks, unmated wo men are known as does, pregnant or figure women are known as dams, and babies are k nown as kittens or pups. An institution of rats is both known as a % or a mischief.

Thrips

Thrips are 1–2mm long torpedo-shaped insects that may be yellow, green, grey, or b lack. Thrips suck the sap of leaves, fruit and flowers and this feeding results in white strea ks on the plants.

Figure-2: Thrips.

Somes pecies are unit carriers of to mato not iced wiltvir us. Ma nage ment with garlic extract, farming soaps orsprays conta iningpy rethrumandpiperony lb utoxide.

White Files

Whiteflies are tiny, 1.5–2.0mm, sap-sucking insects which will injury vegetables full-grow n within the open and in greenhouses.

Figure-3: Whitefly.

Damage is worst in spring and autumn. The adults resemble small moths and fly in large numbers when disturbed. The younger levels don't have any wings and appearance extra li ke scale insects. Insects like lacewings, ladybirds and hoverflies will feed on whiteflies.

Whiteflies can be difficult to control using pesticides. Control with sprays such as garl ic extract or sprays containing pyrethrum and piperonyl butoxide. Horticultural soaps and soapy water may also reduce numbers.

Caterpillars

Caterpillars are normally the larval levels of moths or butterflies. They're generally fur less, with a protracted round frame from 10 – 50 mm lengthy and variety in colour. Cate rpillars may also assault leaves, stems, flowers, end result and roots.Green caterpillars of the massive cabbage white butterfly and the small diamond- reverse(cabbage) moth ca n oppressively harm the leaves of the Brassica own circle of relatives which incorpo rates broccoli, cabbage, kale and cauliflower.Cluster caterpillars, woolly endure caterpilla rs and looper caterpillars will assault the leaves of maximum vegetables.

Figure 4: The woolly bear caterpillar will eat just about anything that's green.

The eggfruit caterpillar bores into aubergine and the native budworm will bore into the fr uit of numerous vegetables, especially, capsicums, tomatoes and sweet sludge. These fr uit pests are hard to kill, and early spraying is needed to kill the caterpillars before they e nter the fruits.

snails and slugs

Pest snails and slugs harm plant seeds, seedlings, underground tubers, leaves, and fruit. Da mage to seedlings regularly consequences withinside the loss of life of the plant, because of this that main manufacturing losses. This net article appears at strategies of lessening snail and slug harm the usage of cultural, chemical, and organic controls.

Figure 5: Snails and slugs.

Control methods

The simplest manage of pests includes an aggregate of cultural, chemical and organic measures. Set a long-time period aim to lessen slug and snail pests, instead of counting o n a 'knee-jerk' response to an instantaneous problem.

Cultural Control

Snails and slugs stay in regions in which plentiful floor cowl and flowers affords best mo isture stages and shelter. This is why they may be a hassle on the brink of a crop with a weedy fenceline. Good hygiene, weed manage and elimination of refuges can lessen the hassle over time. Be aware, though, that pest issues may also growth withinside the qu ick time period after this process, because the pests will now no longer have the weeds fo r meals or shelter. Cultivation of the floor now no longer simplest kills pests directly, however, affords a sterile habitat from which survivors flee. A quick fallow duration can enhance this effect. Good hygiene will enhance the cost of different methods, specia lly baiting.Some ideal agricultural and gardening practices can unfortunately additional ly resource pest molluscs. Minimum tillage and straw-retention strategies can assist t hose pests continue to exist and make seedlings greater vulnerable to damage. Increasi ng the natural content material of the soil and mulching additionally enables to growth its moisture content material and this makes it greater.

Mites

Mites have 8 legs in comparison to insects (that have six legs) and at much less than 1mm in length are tons smaller than maximum insects. Mites are sapsuckers and harm can variety from stippling at the leaves of the plant, to bronzing of the stems and leaves.

Figure-6: Mites.

They are most active in dry weather and sprays of water beneath the leaves will reduce numbers. Control with horticultural soap which should be sprayed beneath the foliage at t he first sign of the mites.

At night, the 10mm adults may attack stems and leaves of asparagus, beetroot, carrots, pa rsnips, peas, potatoes, rhubarb and silverbeet.

Tomato russet mite on tomatoes
Most people are unaware of this pest because it cannot be seen with the naked eye. A lens which magnifies 20 times is needed to recognise these mites.

In summer, the damage they cause is easily identified. The stems of the plant become bro nzed, the lower leaves wither and die and the skin of the fruit becomes leathery.
Two-spotted mite or red spider mite.

A serious summer pest of most crops, two-spotted mites are usually first noticed by the yellow stippling of the leaves, which look russetty and dry.

Dorsal view of a two-spotted spider mite with ingested food visible in the stomach sacks.

Two-spotted spider mite with ingested food visible in the stomach sacks.

The undersides of the affected leaves usually have fine webs, under which there are h undreds of small yellow to red mites about 1–2mm long and pearly eggs. The mites suck t he sap of the leaves.

4.Weeds

Annual weeds: - Weeds that germinate and propagate by seed and have a shelf life of one year.

Biennial weeds : - Weeds t hat comp letet heir cycle in two years.

perennial weeds: – Weeds that recur every year and that often produce long taproots in addition to seeds.

A weed is a factory considered undesirable in a particular situation," a factory in the wro ng place", or a factory growing where it isn't wanted.[3] This introduces the conception of

humans and their pretensions in a particular setting.[4] The conception of weeds is part icularly significant in husbandry, where the end is growing crops or ranges of a single s pecies, or a admixture of a many asked species. In similar surroundings, other factory s pecies are considered undesirable and thus a weed. Either some weeds have undesirable c haracteristics making them a factory pest in most mortal settings.[5,6]

Figure-7: Cannabis green weed.

Example of weeds are shops unwanted in mortal- controlled settings, similar as ranch la nd, vineyards, auditoriums, meadows, premises, domestic and artificial areas. Taxonomica lly however, the term" weed" has no botanical significance, because a factory that's a weed in one environment, isn't a weed when growing in a situation where it's wanted. I n the same way, levy shops are regarded as weeds in a posterior crop. Some shops that are extensively regarded as weeds are designedly grown in auditoriums and other cult ivated settings; in which case they're occasionally called salutary weeds. The term weed is also applied to any factory that grows or reproduces aggressively or is invasive outs ide its native niche.[7] More astronomically, the term" weed" is sometimes applied pejo ratively to species outside the factory area, species that can survive in different surround ings and reproduce snappily; in this sense it has indeed been applied to humans.[8] Weed control is important in husbandry. styles include hand civilization with hoes, powered civ ilization with tillers, smothering with mulch or soil solarization, murderous hanging wit h high heat, burning, or chemical attack with dressings and artistic styles similar as crop gyration and furrowing land to reduce the weed population.[9]

1.1 .3 Method ofpest controls

1.1.3.1. Natural pest control

Topographical influence of the season's changes, changing temperatures, rainfall, soil, atmospheric humidity and other natural factors also shows their effect on insects and thei r hips.

1.1.3.2. Artificial pest control

Artificial control of pest have been developed by man.

These methods can be categorised as mechanical, Agricultural, chemical and biological methods mechanical pest control By using manual labour as well as mechanical devices for collection or destruction of pest.

Like hand picking, burning, trapping is employed for the destruction of eggs, larvae and adult insects.

AgricuIture pest control:- It is the oldest met hod and includes deep ploug hing fore rad ication of weeds a nd early stages of i nsects. A lte r nat ive c ro p rotation of c ha ng i ng e nv iron me ntal cond it io ns are so me met hods which lead too bstruction of the life cycle of pests.

Chemical pest control chemical agents are used for killing pests or for protecting crops, animals, or other properties against the attack of the pest. Like DDT, BHC.[10]

The most well- known way of controlling pests is by using fungicides and rodentic ides. Chemical types of pest control have been seen as dependable and attack a large po rtion of the pest population. Fungicides are generally used in certain circumstances where no other system will work. exemplifications of chemical pest control include Germicides. These chemicals specifically target and kill insects. They come in the form of sprays a nd grains, and should, immaculately, be handled with care. The scrap form of germic ides is aimed at treating theatre pests similar as slugs and draggers. The spray form can help control aphids, and sprays are also still used on non-organic crops.

Rodenticides are a veritably murderous type of fungicide. They're incredibly strong and a re used in the treatment of rodents. They should be handled by a good pest technician. A

lot of pest regulators do n't use rodenticides any longer because of the peril position i nvolved to wildlife.

poison baits are specifically used together with a few bodily strategies of controlling pests, inclusive of traps. Many poisons utilized in pest manage are withinside the shape of gel or in pellets. Poisons are meant to be eaten via way of means of the pest, and a nything isn't eaten receives taken again to the nest to cull the populace at source.

Insecticides· These chemical compounds in particular goal and kill insects. They come wit hinside the shape of sprays and granules, and should, ideally, be treated with care. The g ranule shape of pesticides is aimed toward treating lawn pests including slugs and snails. The spray shape can assist manipulate aphids, and sprays also are nonetheless used on non-natural crops.

Biological pest control: - Biological pest control uses the natural enemies of the pests to destroy them.

Like keeping cats in granaries and mills.

1.1.3.3. Physical pest control

Physical pest control relies on the use of outfit and pest proofing. utmost physical pest control styles should be carried out by an educated and good pest regulator. Some physical styles abolish pests or remove them; other styles concentrate more on foresta lment. exemplifications of physical pest control include.

Pest proofing which involves keeping pests out of your home, business or theater by creating a hedge to entry. It can also include barring their nests. By taking away a pest's parentage ground, it can stop infestations from developing. It'll also stop any current i nfestation from getting worse.

Traps and bait stations are the most common of all the physical pest control styles. Tra ps are a great system for landing small creatures like rodents and insects. However, t hey've to be checked regularly and any pests removed, if you want traps to work effect ively.

Temperature Control. Axes of temperature, both hot and cold, can control pests. For il lustration, heat treatment will kill bedbug grown-ups, eggs and naiads at certain tempe ratures. At the other end of the scale, placing grown yield in cold storehouse holders s lows down or eliminates the growth of insects.

The most natural types of pest control would involve going down the natural route. Th is type of pest control does n't use any kind of fungicides or chemicals. rather it uses nat ure to fight off pest infestations. The usual way of exercising this type of pest control is to introduce natural bloodsuckers into the terrain.

1.2 Classification Ofpesticides

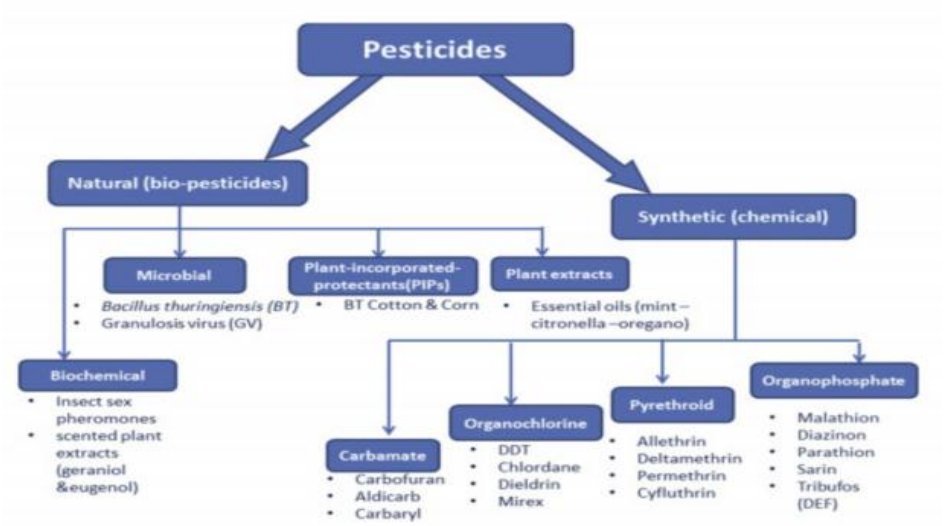


Figure-8: Classification of pesticides.

1.2.1pesticides are CIassified accordingto the pesttheycontrol

Insecticides (Ants, moths, cockroaches)

Herbicides (weeds)

Fungicides (control fungal diseases • Rodenticides (Rats)

1.2.2. Synthetic pesticide: Har mful effectp roduced

0rgan chlorine(0c): - is a collection of chlorinated compounds having excessive persiste ncy. OC pesticides have been in advance correctly used on top of things of malaria and typhus, but they may be banned in nearly all of the superior international locations. The i nformation at the use of various insecticides displays that 40% of all applied insecticides be long to the organ chlorine. Due to their decrease fees and the want in opposition to dive rse pests, organochlorine pesticides inclusive of aldrin, hexachlorocyclohexane (HCH), D

DT, and dieldrin are the various maximum broadly used insecticides in growing internat ional locations of Asian continent.

ex: - DDT (Dichlorodiphenyl tricolour ethane), BHC (Benzene hexachloride), Alderin, Dield rin, Endrin, Endosulphan, Pentacholororous, Chlordane

0rganophosphorus: - are esters of phosphoric acid. The OP pesticide asserts its conseq uences thru irreversible inactivation of the enzyme acetylcholine, that's crucial for anx ious machine features in dwelling organisms (insects, animals, and humans). OP deg rades unexpectedly via way of means of hydrolysis on publicity to light, air, and soil.

Ex: - Malathion, Parathion, Methyl parathion, Fenitrothion, Thiometon, Dimethoate, Pho rate, Tetra ethyl pyrophosphate

Carbamates:- Organic additives crafted from carbamic acid (NH2COOH) are saved on th is category. The practical institution gift in insecticides is carbamate ester. Its mechanis m of movement is through reversible inactivation of the enzyme acetylcholine. Carbofura n, Propoxur, Addicarp, Phenyl carbamate.

Triazines: - Atrazine Simazine

1.2.3. Natural pesticides: - No such har mful effect.

1.2.3.1. Microbial pesticides

These are derived from microorganisms together with bacteria, fungi, and viruses. The lively molecules/compounds remoted from those organisms assault unique pest species or entomopathogenic nematodes. Those called bioinsecticides, goal bugs that damage c rops, whilst people who manipulate weeds through microorganisms, consisting of fungi are known as bioherbicides. Over the ultimate decade, large studies sports on microbial b iopesticides have brought about the invention and improvement of a terrific wide var iety of biopesticides and feature paved the manner for his or her marketability.[11] The a hit use of Bacillus thuringiensis (Bt) and a few different microbial species brought about the invention of many new microbial species and strains, and their treasured pollution a nd virulence elements that may be a boon for the biopesticide industry, and a number of t hose had been translated into business merchandise as well.[11,12] Major organizations of bacterial entomopathogens consist of species of Pseudomonas, Yersinia, Chromobacteriu m, etc., whilst fungi include species of Beauveria, Metarhizium, Verticillium, Lecanicilliu m, Hirsutella, Paecilomyces, etc.[13,14] Other essential microbial pesticide manufacturers a

re baculoviruses which might be species unique and their infectivity is related to the c rystalline occlusion our bodies which might be lively towards chewing bugs (Lepidoptera n caterpillars).[14] The baculoviral occlusion frame is essentially a virion this is blended with the Bt toxin to supply recombinant baculovirus (ColorBtrus), generating occlusion our bodies that include the Bt insecticidal Cry1Ac toxin protein for reinforcing the veloc ity of movement and pathogenicity with appreciate to its wild-kind counterpart.[14]

1.2.3.2 Biochemical pesticides

Biochemical insecticides are evidently happening merchandise which might be used to manipulate pests via safe mechanisms, while chemical insecticides use artificial molecu les that without delay kill pests. Biochemical insecticides are in addition labeled into d ifferent sorts relying upon whether or not they feature in controlling infestations of insect pests with the aid of using exploiting pheromones (semiochemicals), plant extracts/oils, o r herbal insect boom regulators.

1.3 Biopesticides

Biopesticides are products and by- products of naturally being substances similar as i nsects, nematodes, microorganisms, shops as well as petrochemicals.[15] Grounded on the nature and origin of the active constituents, biopesticides fall into several orders similar as botanicals, antagonists, compost teas, growth promoters, bloodsuckers, and pheromo nes.[16] shops and microorganisms are the major sources of biopesticides due to the high factors of bioactive composites and antimicrobial agents.[17] The active composites in s hops include phenols, quinones, alkaloids, steroids, terpenes, alcohols and saponins.[18] Different factory families have varied antimicrobial bioactive composites which include oil painting factors similar as α- and β- phillandrene, limonene, camphor, linalool, β- caryo phyellene and linalyl acetate depending on the factory family.[19,20] Microbial biopestic ides include bacteria species similar as Pseudomonas, Bacillus, Xanthomonas, Rahnella a nd Serratia or fungi similar as Trichoderma, Verticillium and Beauveria lineage.[21] Bio pesticides parade different modes of action against pathogens similar as hyperparasitism, competition, lysis and predation.[22]

Factory growth promoting rhizobacteria cover shops from biotic and abiotic stresses a nd they also enhance factory growth and enhance conformation of root hairs.[23] The most common species of factory growth promoting rhizobacteria include Agrobacterium, Ensifer, Microbacterium, Bacillus, Rhizobium, Pseudomonas, Chryseobacterion and R

hodococcus.[24] They populate the terrain around the factory roots, fix nitrogen, increase p hosphate solubilisation and affect in general increase in factory yield.[25] Species of Pse udomonas and Bacillus have been used as biofertilizers with reports showing increase in factory growth, yield and phosphorous and zinc content in fruits and soils.[26] Natural adversary Rebotaning blood suckers, pathogens and some insects are also used as bio pesticides in operation of nonentity pests. Parasitoids, wasps, beetles, lace bodies, bugs a nd lady catcalls are used in operation of destructive pests similar as boll worms (Helicove rpa armigera) in important crops similar as cotton.[27,28] Compost teas are filtrates of com post excerpts and are also used as bio pesticides.[29]

This review discusses the current status of knowledge on biopesticides including their so urces, product, expression, commercialization, part in sustainable husbandry and their lim itations. It also brings together the different types of biopesticides and attestations of thei r use against important pests in different crops.

Bio means involving life or living organisms.

Pesticide:- A pesticide is any toxic substance used to kill animals or plants that cause economic damage to crop or ornamental plants.

Biopesticide: - is a formulation made from naturally occurring substances that control pests by non-toxic mechanism and in an eco-friendly manner.

Biopesticide may be derived from animals (eg:-nematodes), plants (Azadirachta india), m icroorganisms (Bacillus thuringiensis)

1.3.1. Neem

Synonyms: margosa

Biological source: - obtained from fresh leaves of the plant known as

Azadirachtaindica

Fam ly - Meliaceae

Geographical source:- It is found in India, Bangladesh, shri Lanka, south Africa.

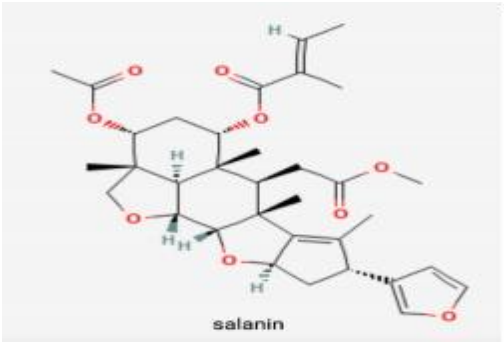
Macroscopic characters

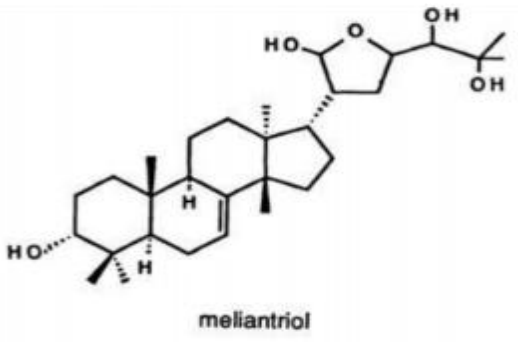
Leaves: - Alternate, exstipulate, imparipinnate leaflets 5.0 - 10 I'm in length lanceolate c losely clustered towards the ends of branches. The leaves have separate margin, green colour and bitter to test.

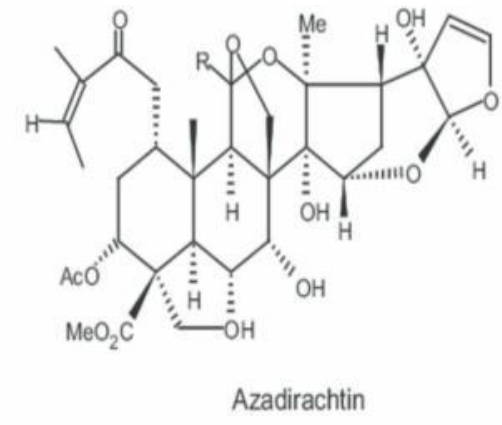
Figure 9: Neem.

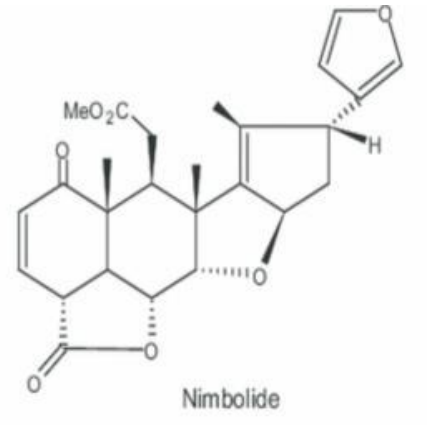
Bark: - moderately thick, rough, brown in colour longitudinally and obliquely furrowed. Laminated with characteristics smell of neem and bitter in taste.

Chemical constituents: - Nimbidin, complex luminous compound named azadirachtin, meliantrol and Sale in etc.









Leaves:- Azadirachtin - insecticide

Meliantriol - anti-feedant

Salanin - anti-feedant

seeds:- Nimbin. - antiviral action

Nimbidin. - antiviral action

Azadirachtin - insect repellent

Flowers:- Nimbosterol, myrictin, kaempferol - insecticidal

Fruits:- Deacetyl azadirachtinol. - Paralyzes insects swallowing mechanism

Bark:- Nimbin, Nimbinin, Nimbidin. - Antiviral

Margolone, margolonone. - Antibacterial

Roots:- Excellent for reforestation Compunds with antibacterial and antifungal properties.

uses - Skin diseases, insect repellent and antimicrobial properties.

Bio-pesticidal Activity of Neem

Neem oil

Neem oil extracted with the aid of using cold-urgent the seed kernels of neem is surprisingly powerful in opposition to soft-bodied bugs and mites. The presence of disulphide in neem oil is a first-rate contributor to its inactivity.[30] The maximum giant insecticidal and healing residences of this agro-medicinal neem issue are illustrated in Figure 9. Neem oil includes extra than a dozen azadirachtin analogs, however the essential contributor to the insecticidal pastime is azadirachtin. The ultimate triterpenoids which include nimbin, salannin, and their derivatives make a contribution little to the efficacy.[31] Interestingly, neem oil is non- poisonous to mammals, birds and fishes and well-knownshows fewer probabilities of resistance, because of its more than one mode of movement on bugs. Many formulations of neem seed oil showcase antifeedant, ovicidal, larvicidal, insect boom regulatory, and repellent pastime in opposition to insect pests. The larvicidal assets of neem oil in opposition to mosquitoes has lengthy been investigated.

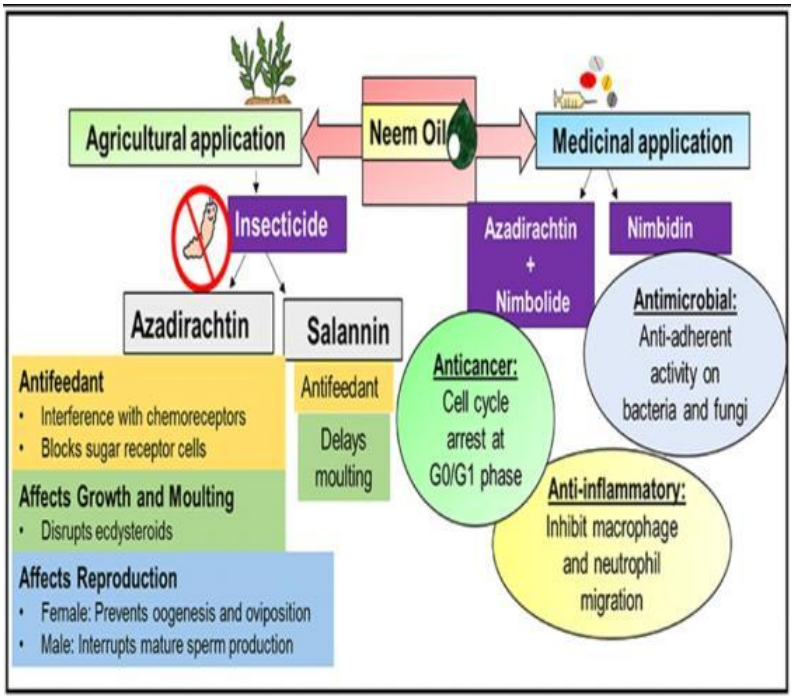


FIGURE -10: -ILLUSTRATION OF AGRO-MEDICINAL APPLICATIONS OF NEEM OIL.

Azadirachtin and salannin are the most important additives of neem oil with insectic idal houses. They each act as antifeedants and put off the technique of molting in i nsects. Azadirachtin and nimbolide additionally showcase considerable medicinal ho uses as they act as an anticancer agent via way of means of arresting the molecular cycle. Another compound, Nimbin, also can be extracted from neem oil, and demand anti microbial houses.

Physiology of Azadirachtin

Indirect Effects - exerted through the endocrine machine. The neurosecretory machine of t he mind tormented by azadirachtin which reasons a blockage of the realese of morp hogenetic peptide hormones e.g., PTTH (prothoracicotropic hormone) and allatostatins. These manage the characteristic of the prothoracic glands and the corpora allata respect ively. Moulting hormone (â-hydroxyecdysone) from the prothoracic glands in flip contro ls new cuticle formation and ecdyses (the act of extrication from the vintage cuticle) whi le juvenile hormone (JH) from the corpora allata controls the formation of teenybopper ranges at every moult. In the person each hormone may be concerned withinside the ma nage of yolk deposition withinside the eggs. Any disruption in those cascade activities v ia way of means of azadirachtin effects withinside the many numerous however well-

described consequences visible as moult disruption, moulting defects and sterility conseq uences.

ii. Direct Effects - on cells and tissues. Azadirachtin is taken up into cells and reasons in hibition of each cell pision and protein synthesis. Such consequences are visible in flaccid paralysis of muscles, midgut cells necrosis and lack of nidi (regenerative cells) of the i ntestine and absence of midgut enzyme production.

The sum general of the physiological consequences of azadirachtin is steady at some stage in species while in comparison to antifeedant consequences. An ED50 of round 1 mg/g frame weight is visible aleven though the various bugs species tested (Mordue (Luntz) & Blackwell 1993).

1 .3. 2 Tobacco

Synonyms:- Tobacco

Biological source: obtained from dried leaves of *Nicotianatobacum* and *Nicotianarustic*.

Fam ly:- Solanaceae

Geographical source:- Tobacco is cultivated on a commercial scale to a very large extent in China, India and United States.

India produces about 5 lakhs metric tonnes of tobacco in a year

It is produced mainly in Andhra Pradesh, Gujarat, Karnataka, Orissa, and cigar.

Macroscopic characters

Colour- Gree norslightly Brown

0dour - Cha racteristic to Nicotine

Taste: Bitter

Size: - 60 - 80 cm in length, 35 - 45 cm in width

Shap:- Ovate, elliptic lanceolate

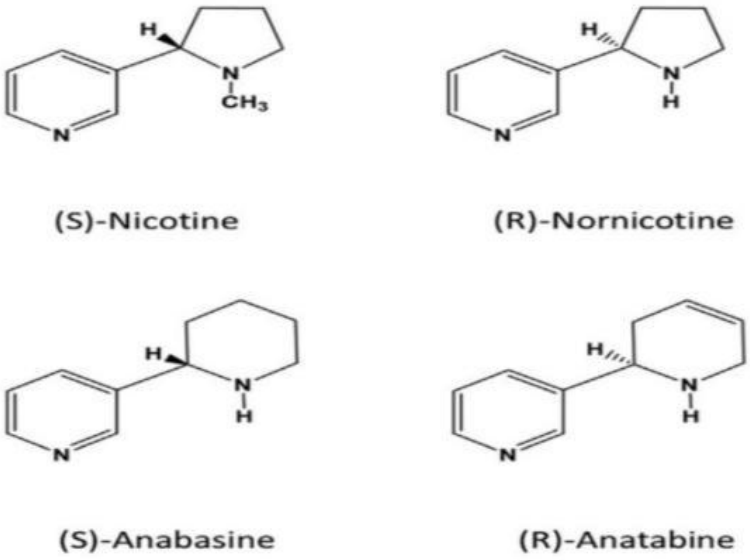
Extra Features

The leaves are usually sessile, sometimes petiolate and with filled wing

Figure-11: -Tobacco.

Chemical Constituents

The tobacco contains pyridine-piperidine type of alkaloids, among which the most pro minent is nicotine. The other alkaloids are nor nicotine and anabasin.



Sedative, Antispasmodic, Veterinary, anthelmintic, useful in smoking and agricultural i nsecticide.

Tobacco and nicotine are known insecticides for last three centuries, Nicotine controls a wide range of insects. It is mainly used against soft bodied insects like aphides. It acts as a contact poison, It is also effective aga inst white flies, moths, butterfly-larvae, red-sp ider mites, etc.

Nicotine is sprayed on crops in the form of nicotine sulphate. It has certain advantage ove r synthetic insecticides that it is safer, easier to handle and much less toxic to warm b looded animals, Because of its volatility, it evaporates earlier and leaves no harmful res idue on the marketable products.

Nicotine, an herbal insecticide produced via way of means of tobacco plants, mimics the chemical messenger acetylcholine withinside the fearful structures of each bugs and hu mans – pretty specific organisms. This illustrates the task of growing pesticides that have an effect on dangerous bugs however now no longer useful ones.

1 .3.3 pyrethrum

synonyms: - Insect flower, Dalmation insect flower.

Biological source:- O btained from more or less fully expanded flower heads of *Chrysanthenium cinerarifolim*

OthervarietiesChrysanthemum coccineum, Chrysanthemum marschali

It should contain not less than 0.7 percent of total Pyrethrum

Family: Compositae

Geographical source

Pyrethrum is cultivated in Yugoslavia (Dalmatia), Japan, Brazil and India. Jammu and Kashmir are the major areas of cultivation in India for pyrethrum.

Macroscopic character

Colour:- Cream to straw coloured

Odour:- Characteristics, aromatic

Taste:- Bitter followed by numbness

Size:- 10 to 15 mm in diameter

Shape:- Flower-head is flat with convex receptacle.

chemical constituents

The insecticidal principles of pyrethrum are located in the oleoresin secretion of floral pa rts of partially open or closed flowers. It also contains other active compound called cineri n I, cinerin II, Jasmoline I and Jasmolin II. All these constituents apre esters.

Figure-12: Pyrethrum.

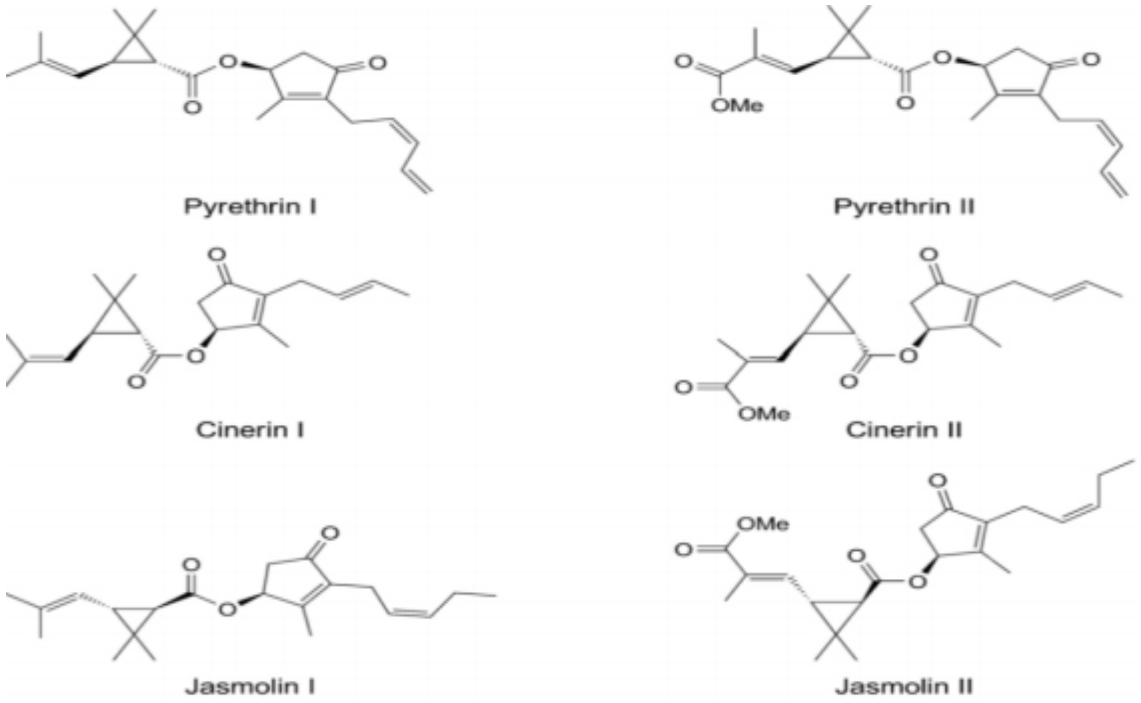


Table-1: -pyrethrum-ester

Sr.no	Ester	Alcohol part	Acidic part
1	Pyrethrin I. mono-carboxylic	Keto alcohol pyrethrolone.	Chrysanthemum acid
2	Pyrethrin II. chrysanthemum	Keto alcohol pyrethrolone.	Monomethyl ester of dicarboxylic acid
3	Cinerin I. mono-carboxylic	Keto alcohol cinerolone.	Chrysanthemum
4	Cinerin II. chrysanthemum	Keto alcohol cinerolone.	Monomethyl ester of dicarboxylic acid
5	Jasmoline I.mono-carboxylic acid	Jasmolone.	Chrysanthemum acid
6	Jasmoline l.chrysanthemum	Jasmolone.	Monomethyl ester of dicarboxylic acid

Standards Of Quality

Pyrethrum should contain not more than 5 percent of naturally adhering stems.

Ash: not more than 8 percent

Acid-insoluble ash: Not more than 1 percent

Uses

Pyrethrum has been used since long as an insecticide and it is a contact of poison.

Insecticides that incorporate pyrethrins have neurotoxic movement on bugs because it b locks voltage-gated sodium channels in nerve axons. Pyrethrins are reasonably poisono us to mammals however, business arrangements are extensively much less poisonous. T hey are dangerous to fish, nonpersistent, and shortage photostability.

1.3.4 Derris

Synonyms: Tuba root

Biological Source: The consist of dried roots and rhizomes of derris D. *malacccensisprain.*

Family: - *Legumonesia*

Geographical source

Ferris (also called Tuba root) is indigenous to East India and Myanmar. Cube root is available from per, Brazil and British Guiana.

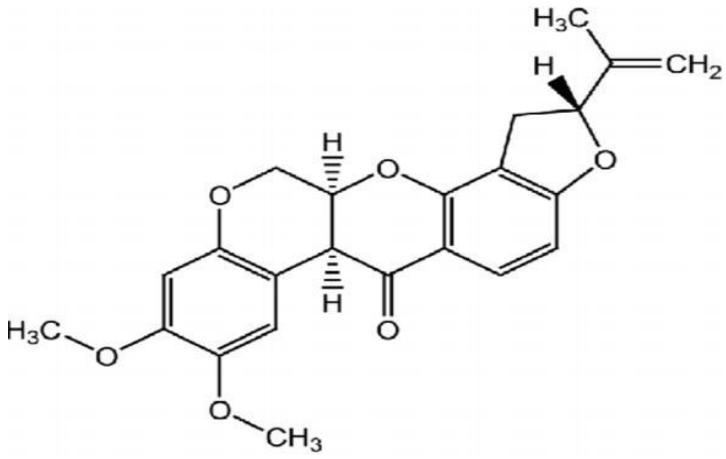
Macroscopic characters

Ferris roots occur as slender pieces having dark red brown or grey, Brown colour. They have longitudinal furrows. They are flexible, lough with a fibrous fracture. Taste is bitter.

Figure 13: Derris.

Chemical Constituents

Rotenone (previously called *tubatoxin*) is present in Ferris and cube roots from 2 - 10% and is an isoflavonoid derivative.



Along with rotenone, derris also contains lephrosin, toxicarol and degnelin. Rote none occurs as colourless to brownish crystals without any odour and taste. It is insoluble in water, but sparingly soluble in alcohol, acetone and chloroform.

standards of Quality

Ash. Not more than 6.0 percent

Acid insoluble ash. Not more than 2.0 percent uses

Rotenone is a contact poison and used in the form of sprays for killing vegetable i nsects during harvesting times, such as leaf hoppers, Mexican bean beetle, cater pillars a nd aphides. For veterinary purpose, it is used to control cattle grubs, fleas and chicken l ice.

1 .3.5 Sabadilla

synonyms

Cevadilla, caustic barely.

Biological source

These are the dried ripe seeds of schoenocaulon officials, belonging to family Lil iaceae.

Geographical source

It is a herbaceous, tall plant indigenous to Venenzuela, Guatemala and Mexico.

Macroscopic character

The seeds are long, narrow, tapering to acute angle and dark brown to nearly black in colour.

They have bitter and acrid taste, and the seed powder causes intense sneezing.

Figure-14: Sabadilla.

Figure-15: -Ryania species vahl

Chemical Constituents

Sabadilla contains a number of alkaloids like cevadine (which is also called crystalline ve ra trine) veratridine, sabadine, sabadilline and among them the first two alkaloids are mo re potent.

The mixture of these alkaloids is called 'veratrine'. uses

Powdered sabadilla is an insecticide used to kill house flies, thrips and bugs in the for m of spray or dust.

1 .3.6 peganum harmala (aspand 0rwild rue)

Peganumharmala (Aspand or wild rue) is a perennial glabrous herb that grows in semi-ar id conditions, steppe areas, and sandy soils (Fig. 16). It has often been used in conventio nal remedy and as an abortive agent.[32] Dried tablets mixed with different elements are b urnt to produce scented smoke this is used to purify the air and the mind; however it's far more often than not used as a charm against "the evil eye".[33] *P. harmala* is a wealthy.

supply of b-carboline and quinazoline alkaloids.[34] The viable use of aspand in contempora ry-day phyto-indole entheogen arrangements is correlated to its b-carboline content: harmi ne, harmaline, and tetrahydroharmine (THH), collectively called harmala alkaloids, that a re more often than not located withinside the seeds and roots. Harmine and harmaline are aggressive and reversible inhibitors of monoamine oxidase type-A (MAO-A) enzymes, whi le THH is believed to inhibit serotonin uptake.[35,36]

Figure 16: Peganumharmala (Aspand or Wild Rue).

Regarding its efficacy in opposition to distinctive insects,[37] determined the toxic im pact of *P. harmala* at the survival, feeding, behavior, and duplicate of the desert locust, *Schistocercagregaria(*Forskal) (Orthoptera: Acrididae), below laboratory conditions.[38] determined that methanol extracts from distinctive medicinal plants, along with P. har mala seeds, have insecticidal results at the larvae and adults of the saved grain pest *Tribolium castaneum* Herbst (Coleoptera: Tenebrionidae) after a length of time.

1 .3.7zanthoxy/um armatum (Tejbal or Timur or Timru)

Zanthoxylum armatum (winged prickly ash) is a species of plant withinside the Rutaceae fa mily. Z. armatum (additionally referred to as Tejbal or Timur or Timru) is an evergreen, t horny shrub, or small tree; achieving a top up to six m. Leaves are 4–20 cm long, impari pinnate, stinky, and fragrant with glabrous, narrowly winged petiole having stipular pric kles at the base. Leaflets are lanceolate, glabrous on the underside, and arise in to 6 pairs. The plant may be diagnosed through its shrubby habit, dense foliage, with stinky fragrant taste, prickled trunk and branches, and small red, subglobose fruit.

Figure-17: Tejbal.

The species is found in warm valleys of subtropical Himalayas, from trans- Indus regions to Bhutan, as much as an altitude of 2400 m, and among seven hundred m and one t housand m in the Khasi Hills. It additionally happens withinside the hills of Ganjam a nd Vishakapatnam at an altitude of approximately 1500 m. Flowers arise in dense termina l or sparse axillary panicles and are inexperienced to yellow in colour. Calyx includes six to 8 sub-acute lobes. Stamens are approximately six to 8 in number. Ripe carpels or fo llicles are normally solitary, faded red, and tubercled. Seeds are globose, shining, and b lack. Flowering happens from March to May, while fruiting happens from July to Aug ust. The plant is customized to subtropical climates of lower heat valleys of the Hima layas with sufficient rainfall. It grows nicely in open pastures and secondary scrub fo rests. Loamy or clayey soil wealthy in natural content material is favored for its cultivat ion. Fruits, seeds, and bark of tejbal are used as fragrant tonic in dyspepsia and fever. Fruits and seeds are useful in dental troubles, therefore used to put together dental paste a nd powder. Tender twigs are used to brush enamel and used as a treatment for toothac

he. The crucial oil from fruits (called Wartara oil) has deodorant and antiseptic propert ies. Z. armatum is likewise used to govern the insect pests.[40,41,42,43,44]

1 .3.9 Advantages and Disadvantages of Biopesticides

Advantage ofbiopesticides

1. Host specificity.
2. Ability to multiply withinside the goal cells.
3. No trouble of poisonous residue.
4. No proof or absence of resistance.
5. No trouble of pass resistance.
6. Conventional method or techniques for applications.
7. Permanent manipulate of pest or lengthy persisting effect.
8. Idealy perfect for integration with maximum different plant safety measures utilized i n IPM programme.
9. No worry of surroundings pollutants and consequently ecofriendly.

Disadvantages of biopesticides

High specificity: which can also additionally require an genuine identity of the pest/pat hogen and the usage of more than one merchandise used; even though this could addit ionally be a bonus in that the biopesticide is much less in all likelihood to damage non-goal species

Slow motion speed (as a result making them flawed if a pest outbreak is a direct threat)

Variable efficacy because of the impacts of numerous factors (on account that a few bio pesticides are residing organisms, which result in pest/pathogen manipulate through mu ltiplying inside or close by the goal pest/pathogen)

Living organisms evolve and growth their tolerance to manipulate. If the goal popu lace isn't always exterminated or rendered incapable of reproduction, the surviving popu lace can gather tolerance of some thing pressures are delivered to bear, ensuing in an evol utionary palms race.

Unintended consequences: Studies have located huge spectrum biopesticides have deadly a nd nonlethal dangers for non-goal local pollinators such as Melipona quadrifasciata in B razil.[18]

2. CONCIUSION

The utility of biofertilisers inclusive of bacteria, cyanobacteria, or fungi can enhance and repair the fertility of the soil and make sure sustainable agricultural manufacturi ng the usage of inexperienced technology. Using microorganisms and microalgae as b iopesticides can lessen the call for for power and intake of artificial fertilisers and repair the performance of agroecosystems and wastelands. These organisms, whilst b lended with using biotechnical improvements consisting of RNAi technology, can p lay a massive function withinside the manufacturing of secondary metabolites, biofert ilisers, bioenergy, and bioprocessed merchandise that might be additionally beneficial in pest manage. RNAi-primarily based totally biopesticides have received sufficient mo mentum in latest years as a narrow-spectrum opportunity to chemical-primarily based totally manage measures for unique and correct concentrated on of pests and pat hogens. In this regard, using bioinformatics-primarily totally based dsRNA choice for powerful RNAi design, coupled with ok experimental testing, will possibly remove the unfavourable affects of RNAi-primarily based totally biopesticides.

Considerable studies on organic manage agents, which include biopesticides, is needed for the improvement of the biopesticide marketplace withinside the future. Sc ientists from numerous studies institutes round the arena are engaged in extensive st udies efforts withinside the subject, however only a few whole and systematic rev iews are available. Here, the maximum collaboration amongst establishments and st udies institutes is needed, without which a situation wherein biopesticides absol utely update chemical insecticides appears impossible. In the modern-day situation, t he rural zone wishes to rely upon each biopesticides and chemical insecticides. However, rushing up the realistic utility of laboratory outcomes need to facilitate mass ive-scale commercial improvement. The influx of biopesticides, however, has notably decreased using artificial chemical compounds due to stringent regulations. Many materials had been researched to illustrate their application as biopesticides (Table however significant subject studies is needed to be able to determine their eff icacy for unique pest troubles beneathneath numerous cropping systems.

Farmers and society at massive need to enjoy the blended and really appropriate use of each traditional chemical insecticides and biopesticides, at the same time as it's far v

ital to emphasize the studies withinside the vicinity of biopesticides for reaping extra blessings from it withinside the future.

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