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Agrohomoeopathy- Does Homoeopathy have Role in Agriculture?

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Abstract: Agriculture is the largest source of income in India and it has massive economical burden on it to provide livelihood. Burden of income and food security has pushed the agriculture sector to use massive amount of chemical fertilizers and pesticides. This use of chemical products in agriculture has produced negative impact on soil health and human health. The alternative to this is organic farming which has use of natural products in substitution to chemical fertilizers and pesticides. Homoeopathy is natural substance which is based on law of similia. It has capability to treat the plant diseases and also to provide strength to the plant to sustain in biological and environmental stress. It also have capability to increase rate of germination and improve growth of plant with no negative impact on soil and human health. Experiments have shown that homoeopathy not only treats the plant diseases but also helps in growth of plant.

Keywords: Agriculture, Homoeopathy, Organic Farming, Agrochemical Compounds.

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INTRODUCTION- Agriculture and its associated sectors is the largest source of income provider in India, especially in rural areas. It is also a major source of contributor in Gross Domestic Product (GDP). [1] It is the primary source of income for about 58 per cent of India's population. Gross Value Added (GVA) by agriculture, forestry and fishing was estimated at Rs 19.48 lakh crore (US$ 276.37 billion) in FY20 (PE). Growth in GVA in agriculture and allied sectors stood at 4 per cent in FY20. During 2019-20 crop years, food grain production was estimated to reach a record 295.67 million tonnes (MT). In 2020-21, Government of India is targeting food grain production of 298 MT. [2]

In India, nearly three-quarters of families depend on rural incomes. The majority of India's poor (some 770 million people or about 70 percent) are found in rural areas and India's food security depends on producing cereal crops, as well as increasing its production of fruits, vegetables and milk to meet the demands of a growing population with rising incomes. [3] In order to increase rural income and provide food security, major burden comes on agriculture.

Green Revolution in India introduced intensive use of chemical fertilisers and chemical pesticides in agriculture. Over the years, the uses of agrochemical products have increased multiple times. Fertilizers play a vital role in the modern agriculture technology. Increased use of fertilizers has increased food production. [4] The consumption of chemical fertilizers in the country has been increased with increase in agricultural production. 83 million tonnes in the 1960s to 252 million tonnes in 2014-15 agricultural production has increased. The consumption of chemical fertilizers has increased from one million tonnes to 25.6 million tonnes in the same period. By 2025, production of food grains will be increased by 300 million tonnes for its population and it will require 45 million tonne of fertilizers to meet this target. It is also observed that 85% of total fertilizer consumed in country is used in 292 districts out of the 525 districts (56%). In addition, the ratio of consumption of fertilizer has been changed and more nitrogen is used. [5]

Along with the use of fertilizers, uses of pesticides have also been increased in agriculture. Pesticides are chemical compounds that include insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, plant growth regulators and others. Pesticides kill adult pests or prevent growth and development in young ones. It inhibits or blocks enzymes, neurotransmitters, hormones or secondary messengers in the various organ systems. Pesticides not only kills the pests, but other animals also, including humans through air, food and water. [6]

USAGE OF AGROCHEMICAL COMPOUNDS IN INDIA

India is the second largest consumer of fertilizers in the world after China. However, average intensity of fertilizer use in India remains much lower than most countries in the world but is highly skewed with wide inter-regional, inter-state and inter-district variations.. [7]

In India, pesticides are registered for agriculture, public health and for use in households. As on 30th October 2016, 275 pesticides were registered for use in India, of which about 255 are chemical poisons. An analysis by PAN India revealed that more than 115 pesticides out of the 275 are highly hazardous. [6]

IMPACT OF AGROCHEMICAL COMPOUNDS ON SOIL

Soil health management is crucial for ensuring sustainable agricultural productions and maintenance of biodiversity. They continue to be critically important tools for global food security; their undesirable effects cannot be overlooked particularly when sustainable agriculture is the universal focus. Apart from a range of widely discussed and well-known adverse effects of chemical fertilizers and pesticides on environment and human health they have also been held responsible for strongly influencing the microbial properties of soil. Fertilizers and pesticides tend to have long persistence in the soil so they are bound to affect the soil microflora thereby disturbing soil health. [8]

Increasing nutrient inputs into terrestrial ecosystems affect not only plant communities but also associated soil microbial communities. Studies carried out in predominantly unmanaged ecosystems have found that increasing nitrogen (N) inputs generally decrease soil microbial biomass. [9]

IMPACT OF AGROCHEMICAL COMPOUNDS ON FOOD

In a study, seven different pesticides and two were analysed in apples, tomatoes, lettuce, strawberries and grapes. These were analysed for each pesticide or pesticide group and 5.2% of the total samples were found to contain residues and 0.31% had residues higher than the respective MRL for that specific pesticide. [10]

In India, the first report of pesticide poisoning was reported in Kerala in 1958, when after consuming wheat flour contaminated with parathion, over 100 people died. [11]

In a multi-centric study to assess the pesticide residues in selected food commodities collected from different states of the country, DDT residues were found in about 82% of the 2205 samples of bovine milk collected from 12 states. About 37% of the samples contained DDT residues above the tolerance limit of 0.05 mg/kg (whole milk basis). [10]

IMPACT OF AGROCHEMICAL COMPOUNDS ON HEALTH

The use of pesticides has boosted agricultural economy by increasing production of food and fibre, and treating vector-borne diseases, but it also have resulted in serious and harmful health implications to man and his environment. Much evidence has shown the potential risk to humans and other life forms and unwanted side effects to the environment by these chemicals. No one is completely protected against exposure to pesticides and the potentially serious health effects, but

the people of developing countries and those belonging to high risk groups in each country are more affected.

In a study, a conservative estimate based on data indicates that there were approximately 110,000 pesticide self-poisoning deaths each year from 2010 to 2014, comprising 13.7% of all global suicides. A sensitivity analysis accounting for under-reporting of suicides in India resulted in an increased estimate of 168,000 pesticide self-poisoning deaths annually, that is, 19.7% of global suicides. [12]

Workers who produce, harvest, store, transport, process, and prepare food and fibers are exposed to many chemicals that are potentially hazardous and that are used in agriculture. Health effect includes tumour promotion, chronic and acute neurotoxicity, immune-toxicity, and reproductive and developmental toxicity. [13]

It is observed that the consumption of chemical pesticides in the country increased from 55,540 tonnes in 2010-11 to 57,353 tonnes in 2014-15, while their imports increased from 53,996 tonnes to 77,376 tonnes in the same period. It is noted that excessive use of pesticides may have a deteriorating effect on the health of both humans and animals. [5]

The largest percentage of accidental poisonings due to agricultural chemicals occurs with the organophosphate compounds in much of the world. An acute poisoning will produce a cholinergic crisis within hours; an intermediate episode may produce paralysis within days; delayed effects may appear as peripheral neuropathy within weeks; and some effects may linger for years. [13]

In looking for risks associated with farm exposures, elevated relative risk (compared to non-farmers) for non-Hodgkin's lymphoma (NHL) has shown up for herbicide exposures, linked to the number of days per year the farmer used pesticides and herbicides, and more specifically associated with the use of the herbicide 2,4-D. [13]

Inhalation exposure to agricultural chemicals is one of the most common exposure paths and one with the potential for substantial health effects. Death after exposure to organophosphates usually is from respiratory collapse. Other lung hazards come from the increasing use of livestock confinement operations, where hydrogen sulfide and methane can accumulate, and in crop storage areas where exposure to high levels of nitrogen oxides, ammonia, carbon dioxide, carbon monoxide, particulates, endotoxins, and mycotoxins can occur. A degradation product of

Alar, UDMH (unsymmetrical dimethyl hydrazine), had been linked to cancer in experiments performed in 1967. [13]

The persistent nature of a number of environmental chemicals has been examined in studies of breastfeeding infants. Breastfeeding is encouraged for the benefits it offers the infant: appropriate amounts of energy for growth, non-allergenic alactoglobulin (versus cows' ,3-lactoglobulin), immune protection against diarrhea and respiratory infections, and a possible protective influence for later adult cholesterol levels and obesity control. One of the metabolites of DDT, DDE, is common in human breast milk and can hasten weaning because it acts like an estrogen to stop lactation. Phenobarbital, alcohol, and PCBs (polychlorinated biphenyls), pharmaceutical drugs, chemicals from smoking, lead, and a number of other heavy metals have been identified in human breast milk. [13]

ROLE OF HOMOEOPATHY IN AGRICULTURE

In present world, agricultural homoeopathy is being increasingly implemented worldwide and it has potential to become alternative to chemical products to deal with negative effects caused by the indiscriminate use of chemical products in conventional agricultural practices.

Homoeopathy is a therapeutic system in which diseases are treated with substances, usually in extreme dilutions, which, when given to healthy individuals, produce the same symptoms as the disease being treated. Homoeopathy is an holistic method of treatment in that the whole organism is treated in an attempt to raise its level of resistance and stimulate its ability to throw off disease. In this respect it is well suited to the holistic concepts of biological agriculture. [14]

Research results in improving germination and growth; to control pest, disease and viral infection, etc. on various crops have been reported. [15] Following the pioneering work of Kolisko (1923) which was stimulated by ideas of Steiner (1920), a large number of experimental studies investigating the effects of homoeopathic dilutions on plants or microbes was published. These experiments were mainly undertaken with the aim of developing an experimental model to test and detect homoeopathic potencies. This work has been reviewed in detail by King (1988), Righetti (1988) and Majerus (1990)

In the plant model, the most replicated study is the protective effect of homoeopathically ultradiluted arsenic versus the effect of arsenic itself in ponderable doses (pre- and post-treatment) on maize seeds. Positive results have been achieved in prevention and control of

plague organisms in the Solanum quitoense Lam crop, in germination and initial growth of Hancornia speciosa Gomes and in remediation of of soils affected by heavy metals. [16]

- **Agrohomoeopathy in Germination:**

The rate of seed germination can be increased under salt stressed condition by the use of Natrum muriaticum200C(Mondal et.al.,2012) and Sepia200C(Sukul et.al.,2012). Lensiet et al., (2010) reported that Nactrummuriaticum6CH have higher capability to increase the growth rate of common beanas compared to Nactrummuriaticum30CH. [17]

Germination of seed is the most important and preliminary step for crop production. found that some homeopathic drugs can increase the rate of seed germination of different plant species. But they functionally vary according to their potency and dilutions. Marques et al.,(2012) worked on Sorghum seed germination treated with Arsenicum album and showed that different potencies of homeopathic drugs can influence the rate of seed germination both positively and negatively. Positive effect of drugs on plants can be confirmed by various biochemical assays and statistical analysis. Phosphorus 6CH can increase the rate of seed germination of Brassica oleracea (Barbosa et.al.,2012). Increased rate of seed germination of radish seeds using Arnica montana9CH was also reported (Donadon, 2011). Along with increased rate of seed germination homeopathic drug can alter protein, sugar, chlorophyll content etc.(Dutta et.al, 2013) (Sukul et.al.,2014). [17]

In an experiment with germination and emergence of cucumber, the results revealed that germination rate and percentage reached the highest value with Homoeopathic treatment with 53% in comparison to the control (40%). The highest germination rate (9 seeds/h) was also obtained with this HOM treatment, compared to control (4 seeds/h). [16]

- **Agrohomoeopathy in Environmental and Biological Stress**

Homoeopathy can help in protecting crops from environmental and biological stress as it helps in treating the disease as well as it also improves resistance to the external factors.

Potentised Homoeopathic medicines has been found successful in many researches in biotic stresses mainly associated with plant diseases caused by various causative agents such as fungus, bacteria,virus,insects etc. A bunch of mulberry diseases(root knot, leaf spot, powdery mildew, mosaic disease and turka disease) can be cured by Aakashmoni 200CH (Dutta and Dutta,2012) and Cina 200CH used to treat root-knot disease only(Dutta,2006).High dilution of Belladonna can affect the mycelial growth of Corynespor acassiicola (Fagan,2011). Root knot

disease is caused by nematodes, whose severity can be reduced by using potentized Cina in cucumber plants(Sukul et al., 2013) and in Lady's finger plants(Sukul et al.,2006). Fungal disease-Rusts can be eliminated using homeopathic solutions Silicea terra 30CH (Bonato et al., 2006). Biotherapic 27CH and 28CH of Alternaria solani has the capability to control early blight in tomato plants(de Toledo et.al.,2010). Betti et al.,(2003) were able to increase TMV resistance in tobacco plants using homeopathic Arsenic.SCMV is causing another plant associated disease, whose infection can be controlled by Lachesis30CH and Isotherapic Virus30CH dynamization (Bonato et.al.,2006). [17]

Environmental or Abiotic stresses may of different kinds, i.e.- Salt stress, heat stress, cold stress, drought stress, metal (copper, nickel, lead, cadmium, arsenic etc) toxicity etc. These are caused by various environmental factors and there are many methods of eradicate these stress conditions. But these methods are either very costlier or inefficient. In most of the cases abiotic stress resistant plants are derived by genetic engineering. Agrohomeopathy is a sophisticated way to resist the plants against abiotic stresses without genetic engineering. [17]

Salt stress (50mM NaCl) tolerance of Cowpea seeds by the treatment of Sepia 200CH was reported by Sukul et al.,(2012). In the same year Mondal et al.,(2012) successfully germinated cowpea seeds under 100mM salt stress using Natrum Meriaticum 200CH as a homeopathic remedy. To overcome metal toxicity, there are several specific homeopathic remedies. Cuprum sulphuricum can combat toxic effect of copper in Vigna ungiculata. Homeopathic medicines Alumina and Calcarea carbonica can improve the rate of seed germination of lettuce seeds exposed to toxic levels of aluminium. Another drug Arsenicum album resulted positive impact on the growth rate of arsenic impaired duckweed. [17]

In a study, In month of August 2007, when the weather was wet with 90% humidity with no air circulation, for at least 3 consecutive days, which is an unfavourable condition for chrysanthemums it was observed that 82% of the plants under control wilted and subsequently died. But all 500 plants treated with Silesia 12C remained unaffected and maintained their healthy growth. They grew to their full term and yielded quality blooms, without any disease or stress. In another study, during monsoon when the sky remains clouded and there is continuous shower, which affects the vegetative growth of the Chrysanthemum. The leaves lose their elasticity, develop necrosis and black spot and eventually die. There is no remedy for such conditions in any other sciences. Homeopathy remedy Dulcamara 30C was sprayed on the

leaves. The plants regain their turbidity (spring action) and resist the black spot infection. All Plants treated show 100% success while all untreated plants grow sickly and eventually succumbed to death. [15]

CONCLUSION

Agriculture is the largest source of income in India providing livelihood to about 58% population. Apart from this, agricultural products are also important food source to almost everyone. In order to increase the agricultural production to meet the demand and increase the income, chemical fertilizers and pesticides are used in large quantity. Demand of these chemical products is increasing day by day. But these chemical compounds have major negative impact on soil health and human health. In soil, it develops the imbalance in soil environment and disturbs the microbial mass of soil. It affects the soil management and its fertility. These chemicals are also absorbed by the plants and when consumed by human it enters in human body, where they are responsible to develop toxicity. One stop solution of these chemical compounds and their ill-effect, organic farming is one stop solution. Homoeopathy can be a important player in this organic farming. Many researchers have proved the efficacy of homoeopathy in farming in managing the soil health and improving the growth of the crop as well as in treatment of plants diseases and also providing strength to the plants to tolerate biological and environmental stress. Furthermore, role of homoeopathy need to be explored more in agriculture demanding more researches. More researches and field trials are required to increase the success rate. In-vitro and field experiments are required to assess the effect of various homoeopathic drugs.

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