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RESEARCH ARTICLE

USAGE OF HOMEOPATHIC TREATMENTS FOR PLANT PATHOGEN CONTROL, AN OVERVIEW OF THE HISTORY AND TRENDS: A COMPREHENSIVE REVIEW

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Abstract

The extensive use of synthetic chemical fertilizers in agriculture is causing environmental problem. In this situation it is desirable to find out suitable agents, which would increase plant growth without compromising with the quality of food and of soil. This paper represents the history and trends of homeopathic drugs utilized in the control of plant pathogens in plant pathology. This method started with the pioneering work of Kolisko in 1923 on wheat germination and Junker in 1928 on growth of microorganisms. Literature search on the Homeopathic drugs in the control of plant pathogens, which have shown the anti-fungal, anti-viral, anti-bacterial properties have been reviewed in this present paper. From the literature during the present study the different homeopathic drugs were found were used in agriculture. The contents of the article cover all the scientific reports published in Agricultural sector from 1966 to till dates. A total 120 papers have been reported from homeopathic treatments used in Agriculture. Amongst these Arsenicum album, Natrum muriaticum, Cina, Thuja were found as the most used compounds. The science of homeopathy has great potentials and could give a new direction that requires attention of the researchers in alternative agriculture. This review discusses the experimental evidence relating to the use of homeopathic drugs in plant pathology, with view to assess the potential of homeopathy in agriculture.

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Introduction:-

Homeopathy could also be a Greek origin that means similar disease. The homeopathic science idealized by Christiane Friendrich Samuel Hahnemann (1755 to 1843), has been applied with very positive results in citizenry, however use in animals and particularly in plants are developed more recently. The homeopathic uses are extremely clear, but their use in plants and soil remain within the very beginning. Currently homeopathy is utilized in various segments of Agriculture, like pest control and plant diseases, increase of active principles or secondary metabolites.

The scientific work of homeopathy in plants is recent. Although the pioneering occurred in 1923 with Kolisko and Kolisko, stimulated by the ideas of Rudolf Steiner, only from the highest of the decade of 60 has news of experiments during this area. One of the earliest works that has mention in his of the Nitienet.al., 1969 in France that the action of homeopathic preparations of copper sulphate (Cuprum sulphoricum 15C) on the detoxification of

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garden pea plants previously intoxicated with this salt in high dosage. Homeopathy could also a very old and natural medicine method using by very old periods, for human diseases apart from the first time some of the authors are used these homeopathic drugs during agriculture in number of the crops and obtained alright results (Jagtap J D, 2017). Most of the studies were conducted by Indian researchers and focused on in vitro fungal spore germination and colony growth and on in vivo fungal disease control by homeopathic treatments.

Homeopathy in agriculture is currently being widely developed. Agro-homeopathy is the specialized area of homeopathic practice used to treat the plants, garden and agricultural purposes. Agro-homeopathy is the most chemical free, non-toxic method of growing plants and other crops that you can get. Agro-homeopathy makes your plants resistant to disease and pests by strengthening them from the inside out. In nature, it is the weakest of organisms that are attacked and destroyed. Agro-homeopathy helps build up the plant's basic structure and gives it optimum growth and health. The use of homeopathy in agriculture has been changing conventional agriculture to Agro-ecological (Andrade *et al.*, 2011), through the application of homeopathic preparations in different dynamization, following the Homeopathic Pharmacopoeia guidelines proposed by Hahnemann in 1810 (Hahnemann, 2013). Homeopathic preparations can be applied on the soil and on the plant (Santos *et al.*, 2011; Andrade *et al.*, 2012). Homeopathic preparations can increase or decrease the production of bioactive substances due to its influence on the primary and secondary metabolism of medicinal plants modifying its phytochemical profile (Capra *et al.*, 2014; Verdi *et al.*, 2016). Homeopathy using in agriculture is a good solution for farmers. They can use this method with confidence that it will neither damage the organism, the soil nor the plants.

Abidi *et al.*, 1977 reported that the Papaya Ring Spot virus was decreased in the papaya when treated with the homeopathic Chimaphila, Lachesis and Rhux tox. Agarwal *et al.*, 1993 reported that the conidial germination was decreased in *Phytophthora colocasia* in *Colocaceaesculanta* when treated with Kali iodatum. Anna kofler 1966 was reported that the improved the plant growth parameters in onion when treated with the homeopathic Sulphur. Benarjee P *et al.*, 2013 reported that, seed germination and peroxidase activity were improved in *Vigna unguiculate* treated with homeopathic Cuprum sulphoricum. Baumgartner *et al.*, 2012 reported that, The objective was to compile a systematic literature review on plant bioassays in homeopathic basic research using predefined criteria. Baumgartner *et al.*, 2012 reported that, the germination was improved in cress seeds when treated with homeopathic Stannum metallicum and texture of biocrystallograms of homeopathically treated cress exhibited specific characteristics.

Benefits of homeopathy in Agriculture

One of the reasons crops are fertilized is to make them absorb more nutrients. However, we never consider that the plants may need additional help being able to absorb the nutrients already present. A properly selected homeopathic remedy can do just that – help increase the nutritional absorption of the plant making them stronger and making them produce truly nutritious food.

1. Promotion of Plant growth health, Nutrition and performance.
2. Promotion of germination per cent in plants.
3. Attenuation of the effects of biotic and abiotic stress.
4. Economical saving and preservation of natural ecology.
5. Neither or nor harmful to plant, soil and other leaving organisms.

Farming without Pesticides

Imagine how organic and biodynamic farmers can take their farming to a whole new level. Think of how much money you can save not having to buy expensive fertilizers, pesticides and other soil amenities while increasing your crop yield. Plus, when you decrease your use of even “Organically certified” pesticides, will be reducing your local and global toxic impact. You can't beat those benefits.

Scope of homeopathic drugs

Use of different homeopathic drugs will give a knowledge to farmers to how grow the crops with eco-friendly management by using homeopathic treatments. Use of different homeopathic drugs in different potencies to develop immunity in plants, control pest and diseases and influence, plant growth opens new vistas for further research in applied homeopathy in Agriculture. Homeopathy remedies stimulate the immune system to fight diseases in plants. Homeopathic drugs available in very low cost comparing with other chemical fertilizers, so farmers can easily use it in agriculture fields.

Homeopathy Research work in India

Homeopathic Research work on fungi

Most of the studies in India were conducted by Indian Researchers focused on in vitro fungal spore germination and colony growth and in vivo disease control by homeopathic treatments.

Authors& Year	Homeopathic drug	Pathogen	Host plant	Reference No.
Khanna and Chandra 1977	Arsenic album, Kali iodatum, Thuja	Alternaria alternata		[47]
Chaube et.al1978	Apis,Kali iodatum, Thuja,Sulphur	Colchilobolusmiyabeanus, Hematonectria haematococca, Penicillium decumbens,		[21]
Kumar and kumar 1980	CinaandSulphur	Alternaria alternata, Pseudocochiloboluspallescens, Cochliobolusaustaliensis	Tomato	[55]
Singh et.al1981	Lycopodium, Sulphur, Bacillinum, Sepia	Alternaria alternata, Cochilobolus lunatus.		[102]
Dua et.al1983	Arsenic albumand Thuja	Alternaria solani, Lasiodiplodiatheobromae		[26]
Mishra 1983	Arsenic album, Calcaria carbonica, Phosphorus	Aspergillus niger	Coriander, cumin	[68]
Singh 1983	Bacillinum, Fagopyrum	Nannizia incurvate, Malbrancheaaurantiaca, Botryotrichumkeratinophilum		[100]
Kehri and Chandra 1986		Lasiodiplodiatheobromae	Guava	[45]
Saxena et.al1987	Thuja,Sulphur	Seed borne fungi	Reed okra	[92]
Agarwal et.al1993	Kali iodatum	Phytophthora Colocasia	Taro (Colocasia esculenta)	[2]
Khanna 1993	Thujaand Lycopodium	Fusarium oxysporum	Wheat	[46]
Rivas et.al1996	Selenium, Natrum muriaticum	Alternaria solani, Aleternariaalternata	Tomato, Wheat	[84]
Rolim et.al2001	Staphysagria	Podosphaeraleucotricha	Apple	[85]

Research work on Nematodes

Paper on nematode infections have published by Indian Researchers all are investigate the root-knot nematode Meloidogyne incognita.

Authors& year	Homeopathic drug	Nematode	Host plant	Reference
Kumar &Sharma 1979	Cina	Meloidogyne incognita	Tomato	[56]
Ray and Pradhan 1985	Arsenic album	Meloidogyne incognita	Tomato	[82]

Research work on Bacteria

Very few studies are investigated the bacterial infections by homeopathic treatments.

Authors& year	Homeopathic drug	Bacteria	Host plant	Reference
Moreno and Alvarez 2003	Staphysagria, Oscillocoquinum	Pineapple Bacteria	Pineapple	[73]
Villegas et.al2008	Staphysagria, Oscillocoquinum	Xanthomonas albilineans	Sugar cane	[119]

Research work on Virus

Few studies on effectiveness of homeopathic drugs on plant virus diseases.

Authors& year	Homeopathic drug	Host virus	Host plant	Reference
Verma et.al1969	Lachesis, Chimaphila	Tobacco mosaic virus	Tobacco	[118]
Khurana 1971	Bryonia, Sulphur, Thuja	Papaya Mosaic virus, Papaya leaf distortion mosaic virus, Papaya Ringspot virus.	Papaya, Tobacco, Goosefoot	[49]
Khatri and Singh 1975	Arsenic album, Chimaphila	Tomato mosaic virus	Tomato, Goosefoot	[46]
Abidi et.al1977	Chimaphila, Lachesis, Rhus tox	Papaya Ring spot virus	Papaya	[1]
Verma and Awasthi 1978	Calcarea,Kali	Tobacco mosaic virus	Tobacco	[117]
Singh et.al1980	Arsenic album	Tobacco mosaic virus	Tobacco	[101]
Shukla and Joshi 1982	Arsenic album, Rhus tox, Dulcamara	Sorghum mosaic virus	Sorghum	[99]
Cheema et.al1986	Thuja,Cedron	Papaya Mosaic virus, Tomato Mosaic virus.	Papaya	[22]

Homeopathic drugs used in different Plant divisions

Authors&year	Homeopathic drug	Worked on	Reference No.
Anna Koffler 1966	Sulphur	Onion	[3]
L Betti et al., 1994	Arsenic album	Wheat seed germination	[57]
L Betti et al., 1997	Arsenic album	Wheat seedlings	[59]
M Brizzi et al., 2000	Arsenic	Wheat seed germination	[62]
Gupta A et al., 2000		Radial growth of oyster mushroom	[34]
N C Sukul et al., 2001	Acacia auriculiformis		[74]
L Betti et al., 2003	Arsenic	Tobacco mosaic virus resistance	[58]
C M Bonato 2003	Sulphur	Growth and productivity of radish	[18]
S Baumgartner et al., 2004		Growth stimulation of dwarf peas	[88]
M Brizzi et al., 2005	Arsenic	Variability of wheat seedling growth	[64]
M Binder et al., 2005	Arsenicum album	Wheat seedling growth	[63]
Rossi F et al., 2006	Carbo vegetabilis		[87]
Witt CM et al., 2006	Mercurius corrosives	Activity of diastase and alpha- amylase	[120]
Scherr C 2006		Growth kinetics of Saccharomyces cerevisiae and Schizo saccharomyces pombe	[97]
Datta SC 2006	Cina	Root knot disease of mulberry	[25]
Coutinho Andrade M et al., 2006		Microbial efficiency in soil treatment	[23]
Hiware CJ 2006	Nux vomica	Fortification of mulberry leaves	[36]
Sukul NC et al., 2006	Cina and Santonin	Root knot disease of Abelmoschus esculentus	[109]

Nani D et al., 2007	Arsenic album		[75]
Scherr C et al., 2007		Duckweed	[96]
Malarczyk E 2008	Phenol	Kinetic changes in activity of HR-peroxidase	[66]
Pereira Giardini Bonfim F et al., 2008	Arnica montana	Issuance of roots of Rosmarinus officinalis and Lippia alba	[81]
Rossimar M et al., 2008	Cymbopogon winterianus	Germination and growth of seedlings of Sida rhombifolia	[86]
Baumgartner S et al., 2008	Gibberellic acid	Reproductivity of dwarf pea shoot growth stimulation	[8]
Scherr C et al., 2008		Stability and natural variability of a Lemna gibba	[94]
Sukul NC et al., 2008		Growth of pigeon pea	[107]
Ruzic R et al., 2008		Molecular information in garden cress germination	[88]
Betti L et al., 2009		Homeopathy in Phyto Pathological models	[9]
Majewsky V et al., 2009		Experimental studies	[65]
Lahnstein L et al., 2009	Arsenicum album	Wheat seedling growth	[60]
StockSchroer B et al., 2009		Experiments in basic homeopathic research	[105]
Bonato CM et al., 2009	Arsenicum album and Sulphur	Growth and essential oil content in Mint	[16]
Shah-Rossi D et al., 2009		Infected leaves of Arabidopsis thaliana	[98]
Moacir Bonato C et al., 2009			[69]
Scherr C et al., 2009		Growth rate of water plant Lemna gibba	[95]
Betti L et al., 2010		Statistical tools for basic research in homeopathy	[14]
Wyss E et al., 2010	Lycopodium clavatum	Rosy apple aphid	[121]
Endler P et al., 2010		Bibliometric study	[29]
Lensi MM 2010	Natrum muriaticum	Standardized culture of Phaseolus vulgaris	[61]
Monteiro de Toledo pizza Gomes Carneiro S et al., 2010	Bio therapeutics of Alternaria solanii	Early blight of tomato plant	[72]
Parveen S et al., 2010		Regeneration in Cassia sophera cotyledonary node explants	[79]
Jager T et al., 2010	Arsenicum album, Nosode and gibberellic acid	Growth rate of arsenic impaired duckweed	[41]
Baumgartner S et al., 2012	Stannum metallicum	Germination of cress seeds	[6]
Pereira Giardini Bonfim F et al., 2010	Alumina and Calcaria carbonica	Germination and vigor of lettuce seeds	[80]
Hartung H et al., 2010	Gibberellic acid	Wheat germination	[35]
Jager T et al., 2011		Homeopathy in abiotically stressed plants	[39]
P flagger A et al., 2011	Gibberellic acid	Wheat stalk growth	[77]
Brizzi M et al., 2011		Wheat germination	[17]
Endler PC et al., 2011	Gibberellic acid	Wheat stalk growth	[30]
Santos FM et al., 2011	Phosphorus	Growth of Verbena gratissima	[91]
Bonato CM et al., 2011	Magonia pubescens	Germination variables in Sorghum bicolor	[15]

Reis B et al., 2011	Acetone	Growth of Avena sativa	[83]
Gomes Carneiro S et al., 2011	Boric acid	Pathogenicity in Bean and tomato	[33]
StockSchroer B et al., 2011		Experiments in Homeopathic basic research	[104]
Fagan RV et al., 2011	Belladonna	Mycelial growth of Corynesporacassicola	[31]
Kiefer P et al., 2012	Gibberellic acid	Wheat germination	[50]
Trebbi G et al., 2012	Arsenic trioxide	Phyto pathological study of cauliflower	[114]
Sukul S et al., 2012	Sepia		[110]
Chandra Datta S et al., 2012	Cina	Controlling mulberry disease	[20]
Kokornaczyk MO et al., 2012	Arsenic	Wheat seed leakages	[53]
Baumgartner S et al., 2012		Plant bio assays in homeopathic basic research	[5]
Da silva HA et al., 2012	Pulsatilla nigricans	Vigor of Soybean seeds	[24]
HribarMarko S et al., 2012	Gibberellic acid	Wheat stalk growth	[38]
Mondal S et al., 2012	Cantharis vesicatoria	Heat shock on Adhatodavasica plants	[71]
Baumgartner S et al., 2012		Cress seedlings	[7]
Hostanska K et al., 2012	Arnica montana	Wound scratch closure of NIH 3T3 fibroblasts	[37]
Modolon TA et al., 2012		Pest management in tomato crop	[70]
Betti L et al., 2012	Arsenic	Wheat germination	[9]
Sukul NC et al., 2012	Natrum muriaticum	Germination and chlorophyll in cowpea	[108]
Jager T et al., 2012	Arsenic album	Weakened duckweed	[42]
Panda SS et al., 2013	Arsenic album	Germination, growth of Pisum sativum	[78]
Sandhimita M et al., 2013		Growth and yield of rice	[90]
Banerjee P et al., 2013	Cuprum sulphuricum	Seed germination and peroxidase activity in Vigna unguiculate	[4]
Sukul S et al., 2013	Chlorocholine chloride	Plant growth	[111]
Dhal NK et al., 2013	Arsenic album Bartya carbonica	Growth and pigment concentration of wheat	[26]
Betti L et al., 2013		Basic research in homeopathy	[13]
Dragicevic V et al., 2013		Growth of maize seedlings	[27]
Chakraborty I et al., 2013	Cina	Root knot nematode infection of cucumber	[19]
HribarMarko S et al., 2013	Gibberellic acid	Wheat seedlings	[38]
Betti L et al., 2013	Arsenic	Wheat germination	[11]
Sukul A et al., 2014		Photosynthesis of cowpea	[106]
Jager T et al., 2014		Weakened duckweed	[43]
Kokornaczyk MO et al., 2014	Arsenic	Droplet patterns serve in Agro-homeopathy	[54]
Trebbi G et al., 2014	Botrytis cinerea	Strawberry plants in fields	[113]
Marotti I et al., 2014	Arsenic	Wheat seedlings	[67]
Kokornaczyk MO et al., 2014	Arsenic	Wheat seedlings growth	[52]
Novosadyuk T et al., 2015		Plant growth in cucumber, Placebo, Potatoes and tomato	[76]
Jager T et al., 2015		Basic research in Phyto-Pathological models	[40]

Smith CW 2015		Bio information and water	[103]
SchererPongratz W et al., 2015	Silver nitrate	Wheat experimental data	[93]
Thieves K et al., 2016		First evidence of Beauvais hypothesis in a plant model	[112]
Kokomacz M et al., 2016	Zincum metallicum	Wheat seed model	[51]
Trebbi G et al., 2016	Arsenic	Spore germination of <i>Alternaria brassicicola</i> and dark leaf spot in cauliflower	[115]
Betti L et al., 2017	Arsenic	Wheat germination	[12]
Ubessi C et al., 2019		Phenolic compounds of infusion and essential oil of chamomile	[116]
Jager T et al., 2019	Mercurius corrosivus	Growth rate of duckweed <i>Lemna gibba</i>	[44]
Filipe Pereira Giardini Bonfim et al., 2019	Natrum muriaticum	Tomato seedlings	[32]

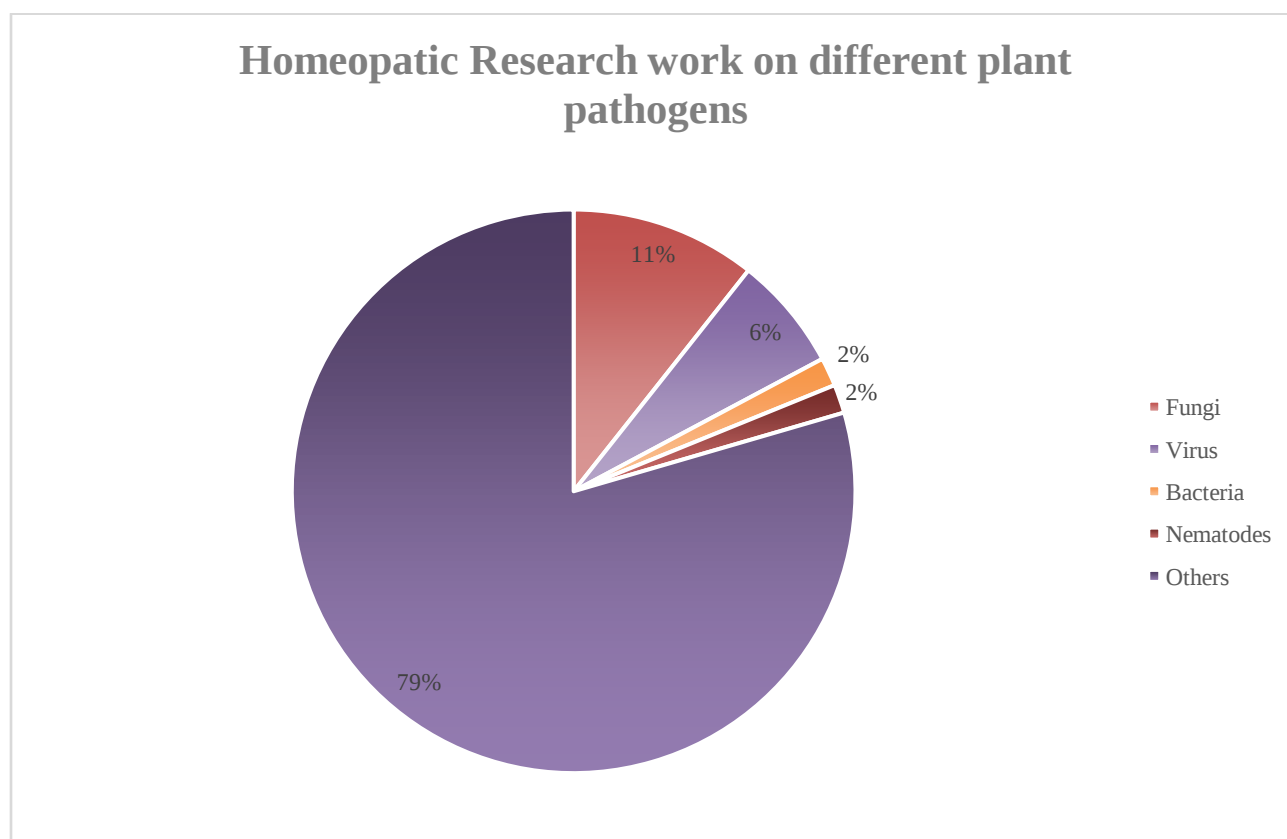


Fig. 1:- Homeopathic research work done on different group of plant pathogens.

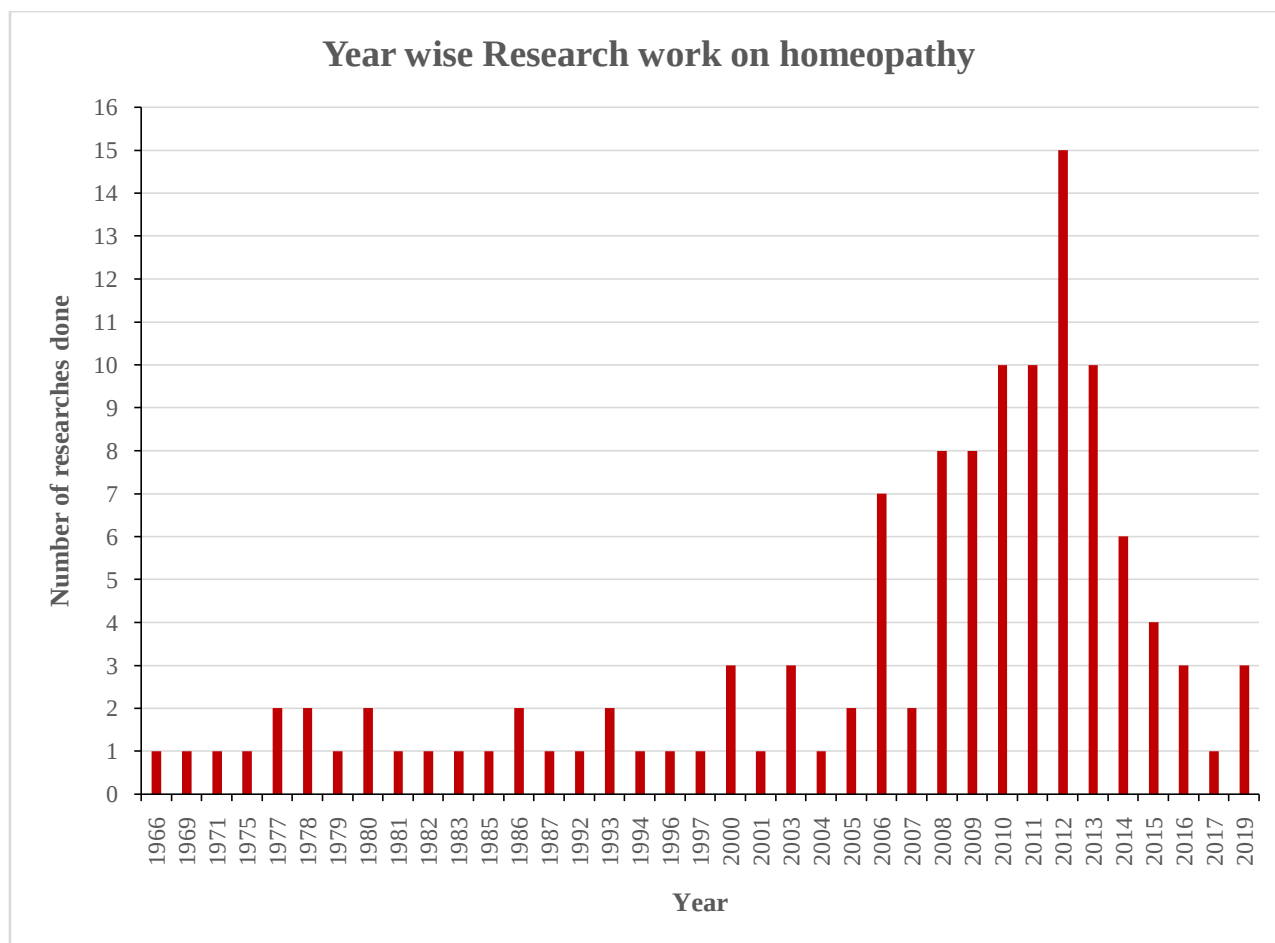


Fig. 2:- Year wise research work of homeopathy on plant pathogens and plant growth parameters.

Instructions for the usage of Homeopathic drugs

1. Use exclusive watering can or backpack sprayers, for applying homeopathy medicines.
2. No commercial plant protection chemicals or fertilizers should be used for at least 10 days after administering the medicine.
3. Stir clockwise and anticlockwise before application. It must be realized that small stimuli encourage life activity, medium to strong stimuli tend to impede it, and very strong stimuli to stop or destroy it.
4. Do not repeat the dose while the plants are getting better.
5. Only repeat the dose if the plants show slight signs of improvement and then the disorder returning in the same way as before.
6. Reducing the frequency or increases the life span, before next dose is used.
7. Seeds can be treated by immersing them in this homeopathic drug contain solution for minimum 20 minutes.

Use of homeopathic drugs for Small Plots or Gardens:

Make sure your dispensing equipment is not contaminated with other chemicals or fertilizers as these may antidote the energetic effects of the treatment. Rinse well with hot water before use if necessary. Add 2ml to each 200 ml of water, shake vigorously, and then spray or water your plants. Avoid using other chemicals or fertilizers for 10 days following treatment so that the energetic effects of the treatment are not anti-doted.

Use of homeopathic drugs for Large Plots or Farms:

Add the remedy to water and apply with the dispensing device of your choice: watering can, backpack sprayer, boom spray, reticulation systems (add to tanks or pumps). Make sure your dispensing equipment is not contaminated with other chemicals or fertilizers as these may antidote the energetic effects of the treatment. Rinse with hot water or steam clean before use if necessary. Avoid using other chemicals or fertilizers for 10 days following treatment.

Market availability of homeopathic drugs

The market for homeopathy medicines is expected to expand due to an increase in the awareness regarding homeopathic medicine. The market shows growth potential in India, Mexico and the middle east nations. In India key player in the global homeopathic medicine market is SBL Pvt. Ltd., Delhi. On the basis of homeopathic drugs, market is segmented into plants based, animal based and mineral based. There are 1000+ more homeopathic stores available in India for purchase of the homeopathic drugs.

Conclusion:-

The present work aimed to report studies associated with the control of plant pathogens and therefore the maintaining the health of plants by using homeopathic drugs, showing its potential as a tool for an agriculture with less environmental impact. We suggested that to work with plant homeopathy, the researcher should concentrate to 3 basic points: the choice of drug, the dynamization and frequency of application on plants. For the choice of homeopathic drug, research should be directed searching elucidate the principles left by Hahnemann through studies of pathogenesis, this is, verifying the symptoms developed when the drug is applied over a healthy plant. The frequency of application is important regarding the control of disease, because is necessary a time between the treatment with inducing agent to improve changes in the plant metabolism before the infection with pathogen, to give an effective protection. At this point, biochemical and histological studies can collaborate to clarify the phenomenon. The difficulties of previous studies described in literature lies in the fact that no complete medical material has been developed with specific indications of phytopathology for the control of plant pathogens. Although the data reported by different authors. The methodology varies from case to case, using various treatments, various concentrations, and there is no standardization that allows identical treatments. It is to use new research models to properly assess the potential of the domain. In particular, we have found there are only few studies on fruit trees, most of the studies being made on wheat and vegetables only. There are only few studies conducted in the field and no specific methodologies have been established for different cultures. Most studies were conducted in growth chambers and seedlings. New studies are needed to development of the work strategy must first be done in laboratory conditions to control more easily the environment.

Outcome:

The main outcomes of this research review to collect and summarize the information about the usage of homeopathy in Plant Protection and provides the information for the research community to conduct further scientific investigations in the plant pathology using the low-cost effective homeopathy for the plant protection.

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Ethics Declarations

The manuscript should not be submitted to more than one journal for simultaneous consideration. The submitted work should be original and should not have been published elsewhere in any form or language (partially or in full), unless the new work concerns an expansion of previous work.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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