

Review Article

Review on Marigold Extract for Disease Management

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ABSTRACT

Environmental problems caused by extreme use of chemical fertilizer is topic of matter from the past years. It has been estimated that damage caused by chemical fertilizers is in billions annually. Excess use of nitrogenous fertilizers can lead to release of toxic gases i.e. greenhouse gases which causes global warming. Continuous use of chemical fertilizers can cause permanent damage to the soil health. With the help of organic fertilizers, we can prevent all these damages by treating the farm as a living system and use everything already present in farm to prevent financial losses and maintain soil health. This review paper focuses on the management of various diseases with the help of marigold extract and how marigold extract can be used as organic fertilizer so that there is less harm on environment, producer's financial state and consumer's health.

Keywords

Marigold extract,
organic,
terpenoids,
Flavonoids, alpha
terthienyl

Introduction

From recent past years plant extractions and their products are been a topic of interest of researchers and microbiologist due to increase in the damage caused by chemicals to environment so plant by products can be used that are decomposable and safe to human health (23). (Ashok Kumar, 2008). Over application of chemicals have a bad impact on environment due to heavy metals present in the chemical fertilizers.

Example-(cadmium and chromium) (24) (Savci, 2012) it contaminates ground water and makes it alkaline (6) (DivyaJ, 2012), destruction of good microbes, damage to soil quality and decrease in the population of insects which helps in pollination (4) (Chen, 2006) so continuity of these chemicals is not

sustainable for future (25) (Ghosh, 2004). Bangladesh which is a south Asian country was affected by excess use of chemical fertilizers result in decrease of crop production(1) (MDPI and ACS Style Rahman, 2018).In United States Of America crop losses due to the use of chemical pesticides is 71,42,06,13,950.00 INR per annum(26) (Kelsey A Hart, 2002).In 2006 the synthetic fertilizer production in china was 212192 tonnes(5) (Dong-Po Li, 2008).Since organic fertilizers are less promoted and produced its time to change our method and technology and move towards organic based fertilizers like plant extracts(25) (Ghosh, 2004). Marigold commonly called as African marigold, American marigold or big marigold Its genus tagetes is indigenous to southwest USA, Mexico, South America, Africa and India (9) (Brijesh Tripathi, 2012)

Marigold is a flowering plant and aromatic annual herb achieves height of 0.4 -1metre in total.

Tagetes erecta(marigold) flowers are bright in colour with florescent odour and bitter in taste. Corolla of *Tagetes erecta* are basically orange in colour and Calyx is dark green in colour (10) (Lokesh J Shetty, 2015)

Chemical constituent

The studies and research helped to know the different chemical constituents of marigold that are Quercetagenin, a glucoside of Quercetagenin, phenolics, syringic acid, methyl-3,5-dihydroxy-4-methoxy benzoate, quercetin, thienyl with overall 45 constituents including lomonene, terpinolene, z-myroxide, piperitone, piperitenone oxide and b-caryophyllene(27) (Pankaj Gupta, 2010)

Tagetes erecta contains Thiophenes, Flavonoids, Carotenoids and Triterpenoids which has been find with some medicinal properties (2,3) (Nikkon, 2009), (Khulbe, 2015) that can be used as insecticides, fungicides and nematicides (7) (Anuj Kumar, 2000)

Merits of marigold extract

It can be used as insecticides (7) (Anuj Kumar, 2000)

It can be used as fungicides (7) (Anuj Kumar, 2000)

It can be used as nematicides (7) (Anuj Kumar, 2000)

It can be used as herbicides (11) (Chamroon Laosinwattana, 2018)

It can be used as fertilizer for growth and development of plant (8) (Gopi G, 2012)

Role of marigold extract as insecticide

*common name-red flour beetle

Scientific name-*Tribolium castaneum*

*kingdom- Animalia

*phylum-Arthropoda

*class-insecta

*order-coleoptera

*family-tenebrionidae

*genus-Tribolium

Red flour beetle is a devastating pest globally which damage the stored grain and have contribution in destruction of approximately one third of global food production annually. (21) (Farjana Nikkon, 2009)

Aluminium phosphide which is a cheap and commonly used pesticide in the management of Red flour Beetle (stored grain pest) (30) (BENGT SJÖGREN, 2007) has various toxic effects. (31) (Omid Mehrpour, 2012) *Tagetes erecta* extract contains terpenoids compounds (29) (Sandeep Kumar, 2017) that can be used as organic insecticide to control pest population without any toxic damage to the environment.(28) (José S. Dambolena, 2016)

Role of marigold extract as fungicide

Disease-Fusarium wilt

Causal agent-*Fusarium oxysporum*

Fusarium oxysporum has attributes of soil borne pathogen and survive inside the soil in dormant phase. During favourable conditions with the existence of plants leads to the

infection perforated through roots result in vessel blockage. Vessel blockage initiates the symptom that start appearing from the lower leaves and further leads to wilting of whole plant result death of plant(18) (Srinivas C, 2019)It has been estimated that yield loss of tomato crop in Uttar Pradesh is approximately 25.14% to 47.94% every year.(19) (AC Jha, 2018) Flavonoids compounds found in marigold extract can be used as organic fungicide to prevent *Fusarium oxysporum*.(32) (Palma-Tenango, 2017)

Role of Marigold extract as nematocide

Common name – root knot nematode

Scientific name -*Meloidogyne incognita*

Kingdom- Animalia

Phylum-Nematoda

Class-Secernentea

Order-Tylenchida

Family-Heteroderidae

Genus-Meloidogyne

Nematodes are infinitesimal round worm that lives and feeds on the roots of the plant. (20) (Bhattacharyya, 2017) Root knot nematodes are group of endoparasite that cause huge economic loss around the world (15) (Stephen B. Milligan, 1998) with approximately 5% of universal crop loss annually. (16) (K. A. Abo-Elyousr, 2010)

The primary symptom of root knot is abnormal swelling of roots due to which plants are not able to uptake nutrients required for the growth and development of plant and shows stunting, leaf wilting and

poor fruit production (17). (Lukas Flis, 2018) From recent few years the high cost and disappointing results of chemical nematicides is a topic to be concerned (34) (Giovanna Curto, 2005).

It is very important to find and apply the measures which are less toxic to environment. (33) (Hajihassani, 2018).

Marigold extract can be used as organic nematicide against root knot nematode due the presence of chemical substances like alpha terphenyl which results in the suppression of root knot without damaging the environment. (35) (Takahiro Hamaguchi, 2019)

Role of marigold extract as herbicide

Weeds which are undesirable plants grow on the main field and compete with main crop for limited surrounding resources(12) (Williams, 2002) also acts as a shelter for various plant pathogens and insect vectors which can cause serious damage to the main crop(13) (Morgan Byron, 2019).

In numerous circumstances weeds are economically more injurious than insect, fungi and other plant pest and cause annual loss of estimated about INR 1050 billion per annum(36) (YogitaGharde, 2018).

An important problem with high toxic chemical components presents in herbicide is that it damages the wide range of area includes non-targeted plants which leads to economic harm. (37) (Gail Ruhl, 2008).

The presence of phytotoxic compounds present in the *Tagetes erecta* extraction can be used as natural herbicide to control weeds with low chances of damage to the surrounding.(11) (Chamroon Laosinwattana, 2018)

Role of marigold extract as non-toxic fertilizer

Fertilizers are synthetic or natural material used to escalate crop yield(38) (Bhattacharya, 2018) Fertilizers helps the plant to provide nutrients for the growth and development as they are produced synthetically it mainly contains nitrogen, phosphate and potash. (39) (F. Morari, 2011)

Synthetic nitrogen is acquired from Haber-Bosch process, phosphate from acid attack of natural rocks and potash can be procured from soluble potassium salt. (39) (F. Morari, 2011)

India is a country with population of approximately 135.26 crores where the demand for food is increasing with the increase in demand for food the demand for the fertilizers also extend. Green revolution which helped to increase the crop production head towards the over application of fertilizers which result in environmental damage (39) (F. Morari, 2011)

The raw extract of marigold contains various chemical components such as flavonoids, Patulin, Quercetagenin, quercetin, carotenoid lutein which works together or separately responsible for medicinal effect of marigold and can be used as organic fertilizer. (22) (Gayatri Nahak, 2017)

There are wide range of methods used to extract the essential components present in different parts of the plant like roots, stem, leaves, bark and flowers.

Industrial methods such as: (Alexandros Ch Stratakos, 2016)(40)

Steam distillation method

solvent extraction

CO₂ extraction

Maceration

Enfleurage

Cold Press Extraction

Water Distillation

Industrial methods are complex method and it requires special skills to perform and requires much time for the extraction which make its value high and unreachable for many farmers

Basic method

In basic method extraction can be easily obtained by drying and blending the different parts (root, stem, leaves, flowers) of *Tagetes erecta* in blender mix with distilled water and filtered after 3 days with Whatman filter paper.

This is the easiest way to extract essential components no special skills are required to perform this task (14) (Kamal AM Abo-Elyousr, 2009) this can help the farmers to save their expenses and can fulfill the requirements of plants easily without damaging the environment.

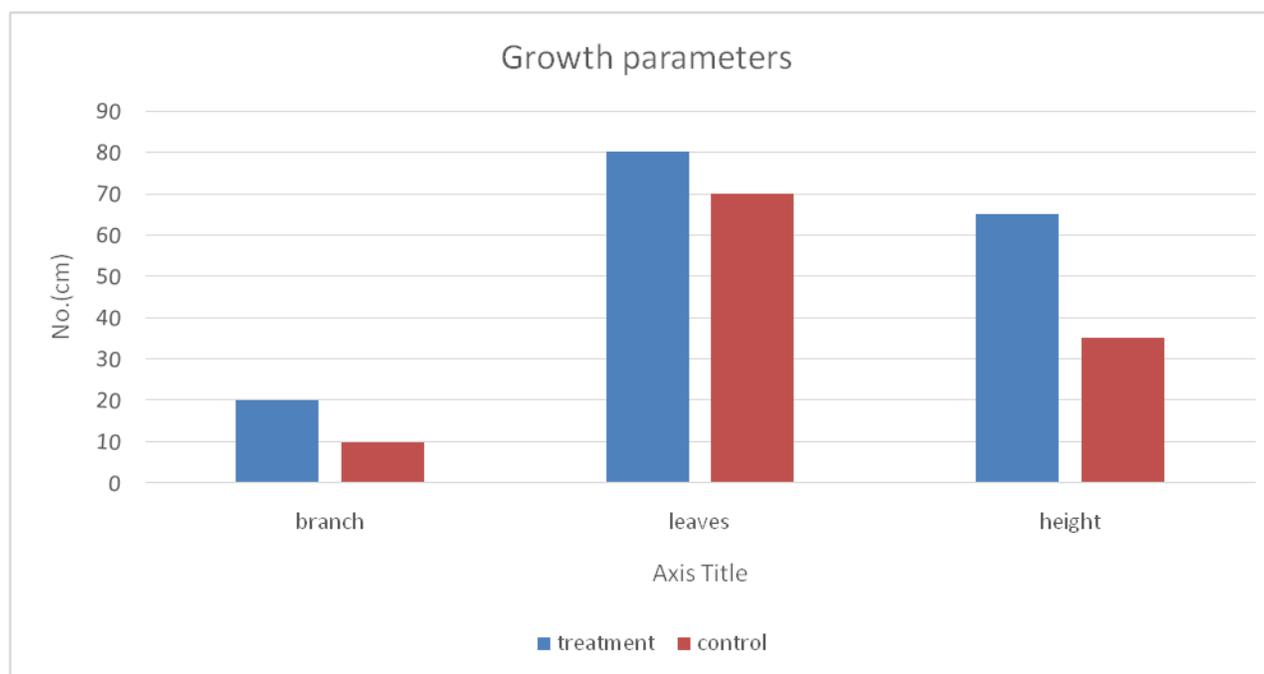
High cost of synthetic chemical fertilizers and their effectiveness depending on crop variety and environmental conditions can hinder the exact effectiveness of its uses.

However, using the organic ways as to say using of marigold extract can target multiples problems without any hinders from the type of variety or is affected by normal change in environmental conditions.

Table.1 Effect of aqueous extract of marigold on different parameters of Tomato (22) (Gayatri Nahak, 2017)

Parameter	10 days	30 days	50 days	70 days	90 days
Branch(Mean±SEM)					
Control	3.60±0.16	6.30±0.30	7.80±0.51	15.0±1.41	17.5±1.52
Treatment	12.70±3.50	13.90±2.81	10.90±2.07	17.10±3.70	22.3±5.07
leaves(Mean± SEM)					
Control	11.4±1.04	26.4±2.91	42.5±3.44	63.4±4.14	68.0±9.45
Treatment	10.4±0.76	25.2±2.10	42.6±2.10	78.6±3.45	79.8±2.56
Plant HT (Mean±SEM)					
Control	6.30±0.49	15.7±1.03	16.4±1.14	29.7±0.88	37.3±1.11
Treatment	4.00±0.25	11.8±0.78	31.1±1.80	45.6±2.68	65.6±2.98

Fig.1



Marigold extract can be synthesized with the goal of less or no toxicity, easy availability, the knowledge of mechanism of marigold extract and its mode of action, the most important part is that it is eco - friendly or it does not leave any harmful chemical residue in soil and food. Moreover, more researches and experiments should be taken out to develop more eco- friendly fertilizers with the growing time.

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