



Garlic extract

Literature review

A short review of recent scientific literature highlighting the beneficial effects of garlic extract in improving plant health and performance.

Introduction

Garlic (*Allium sativum*) is a close relative of other members of the Allium genus including onions, chives and leeks. It is believed to be a native of central Asia but garlic is now cultivated throughout the world mainly for use in cooking. It has a unique flavour and a number of health promoting properties. Folklore attributes garlic with good luck and protection against evil. The smell was said to ward off werewolves, warlocks and - of course – vampires!

Man's association with garlic goes back some 7,000 years and there is much anecdotal and scientifically proven evidence of the plant's beneficial effects in human, animal and plant health. Hippocrates reported its use for controlling parasites and curing respiratory problems and the bactericidal properties were discovered by Lois Pasteur in 1858. Activity against fungal diseases of plants such as mildews has also been demonstrated.

Garlic (and other plants) has for many years been used as a companion crop for cultivated plants to help them withstand attack by pests such as aphids and caterpillars. This use exploits the natural biologically active defence compounds produced by plants.

The principal biologically active compound produced by garlic is allicin which was discovered in 1944. Allicin is a sulphur containing (thiosulphonate) compound with powerful antioxidant and other properties. Undoubtedly allicin synthesis has evolved in garlic as the plants first line of defence against pest attack.

This knowledge provided the platform on which the Aston range of products were created by Hugh Struth the founder of Aston Horticulture Ltd who sadly passed away in 2014. Hugh spent three years in Research and Development of garlic and other natural products before bringing his first garlic product to the market in 2001.



There follows a literature survey highlighting some of the recent scientific work which details and has demonstrated the beneficial effects of garlic in plant/crop production.

Control of nematodes in ground nuts (1)

Six treatments with plant extracts including garlic and a synthetic pesticide were compared with respect to the control of nematode caused root-knot in groundnuts. While the best results were obtained from the synthetic nematocide, the garlic extract showed good effect in promoting plant growth and suppressing the nematode.

Control of western flower thrips (WFT) in strawberry (2)

Experiments were conducted to assess the efficiency of four plant extracts including garlic for the control of WFT in greenhouse strawberry. The study is demonstrated the suitability of garlic extract, as botanical insecticide, for inclusion in WFT integrated pest management programs.



Activity of garlic extract against plant pathogenic fungi (3)

In an *in vitro* experiment showed that the growth of *Alternaria*, *Botrytis*, *Magnaporthe* and *Fusarium* was inhibited by application of garlic extract (allicin) placed on agar plates seeded with fungal spores.

Garlic treated rice seedlings showed greater resistance to attack by rice blast disease (*M. grisea*) with treated plants showing fewer symptoms.

In further work significant effects on the development and pathological symptoms *Phyophthora infestans* (potato blight) were observed following exposure to allicin. Prophylactic treatments were more effective than curative treatments applied post infection.

Control of damping-off and mildews in cucumber (4)

Plant extracts including garlic reduced the activity of cucumber soil-borne pathogens. Similarly, weekly foliar sprays of the extract reduced the incidence of both powdery and downy mildews. As well as controlling disease the sprays had a beneficial effect on cucumber yields.



Control of tomato leaf miner with plant extracts (5)

Plant extracts including garlic were prepared and tomato plants infested with leaf miner were sprayed three times at two week intervals starting after 40 days from transplanting. All treatments reduced population density of leaf miner significantly. The highest reduction was

recorded by garlic extract followed by lemon grass extract and basil oil. Also, garlic extract increased the yield of tomato significantly.

Effect on fungal spore germination (6)

Complete germination inhibition of the spores of *Alternaria* spp, *Colletotrichum* spp *Fusarium* spp was reported when they were exposed to garlic extract. Similarly the compounds were seen to halt mycelial growth when applied after spore germination.

Effect of garlic on red spider mites and nematodes (6)

100 % mortality of *Tetranychus urticae* was observed after 14 hours exposure to garlic extract which is similar to conventional acaricides. Similar levels of mortality were observed when second stage juveniles of *Heterodera cajani*, the nematode causing root knot in pigeon peas.



Effect on foot rot and leaf blotch in cereals (7)

Garlic extract showed fungicidal activity on the endogenous fungal contamination of the wheat seeds and particularly reduced the degree of disease caused by *Bipolaris sorokiniana* and *Drechslera tritici-repentis*. Allicin in garlic juice corrected the poor germination of wheat seeds caused by natural mycoflora of grain. Comparable results to synthetic fungicide treatments were observed.

Potential for garlic extract to be used as a fungicide (8)

The results from our study suggested that garlic extract affected germination of spores of the three fungal wheat pathogens tested with noticeable inhibition of the growth, spore germination, and induced modifications in the morphology or structure of hyphae and conidia. Restriction of the radial growth of the fungal colonies suggests a good antifungal effect even up to 10 days. Results support the use of garlic extract as a useful, cost effective and environmentally friendly management strategy in controlling the leaf-spotting complex in wheat plants, with the purpose to minimize the use of fungicides. Its advantages are its simplicity and safety.

Activity of garlic extract against two species of diptera (9)

Exposure of the two species, *D. radicum* and *M. domestica* to different concentrations of garlic juice revealed insecticidal effect across life stages.

Mortality rates caused by the garlic juice were comparable with those obtained with an organophosphate pesticide indicating parity of effect at various concentrations depending on life stage.

Garlic extracts, legislation and registration aspects (10)

Garlic extracts and other naturally derived plant chemicals are becoming increasingly subject to official recognition in regard to their pesticidal activity. Similarly, legislative control is being applied by various governments requiring regulatory compliance wherever pesticidal claims are made. The use of these extracts to improve plant health and increase disease/pest resistance are currently and largely unregulated.

Effect of garlic extract on early blight of tomatoes (11)

The antimicrobial activity of six plant extracts including Garlic was tested for controlling early blight (*Alternaria solani*) in vitro and in vivo. In greenhouse experiments the highest reduction of disease severity was achieved by the extracts of garlic at 5% concentration and Jimsonweed at 1% and 5% concentration. The greatest reduction of disease severity was achieved by garlic at 5% concentration. Garlic extract at 5% concentration increased the fruit yield by 76.2% and 66.7% compared to the infected control.

All treatments with plant extracts significantly reduced the early blight disease as well as increased the yield of tomato compared to the infected control under field conditions.

Acknowledgements

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