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Effect of "*Panchakavya ghirta*" against Chlorotic Leaf Spot Disease in *Oryza Sativa* L

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Abstract

The present work is focused on the effect of disease on active phytochemical constituents in leaves of paddy. The symptoms of chlorotic leaf spot disease include systemic brilliant yellow spots on the leaves which may be due to deficiency of minerals such as iron, magnesium, nitrogen, protein, zinc. The results clearly indicate that the application of *panchakavya* could be a viable alternative to the chemical methods to control disease.

Key words: Iron, Magnesium, Nitrogen, Protein, Zinc, Chlorosis,*Panchakavya*, Monochrotophas.

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INTRODUCTION

Organic farming is the pathway that leads to live in harmony with nature. Organic agriculture is the key to sound development and sustainable environment. It minimizes environmental pollution and the use of non-conventional natural resources (resources other than traditional resources). It conserves soil fertility and soil erosion through implementation of appropriate conservation practices.(Palaniappan and Anandurai, 1999).

Chlorosis

Chlorosis is an abiotic (not caused by a living organism such as a fungus or virus) disease. It is characterized by the greenish-yellow or yellow leaves. Much of the chlorotic symptoms seen in our area on trees is actually iron chlorosis or chlorosis caused by lack of iron in the plant tissues. Iron is needed for the formation of chlorophyll, the green pigment in leaves which helps the plants to synthesize their own energy in the presence of sunlight. (Alloway, 2015).

Symptoms

The symptoms of chlorortic leaf spot disease include

- Plants with iron chlorosis, first turn yellow-green to yellow between the veins, with the veins remaining a darker green at severe condition of chlorosis
- The leaves become pale yellow and develop brown spots between the main veins
- The leaf margins may also turn brown with the leaves later drying up and falling off and the tree growth slows to a stop and dieback of branches can occur when iron chlorosis is extremely severe.

Causes

Iron chlorosis is quite common in our area because the wet land is mostly alkaline or near alkaline and the soil is often over pH 8.0. The alkaline condition of the soil does not allow the mineral form of iron available to plants. Within the same yard, there may also be perfectly healthy green trees growing right next to ones with iron chlorosis. While it's common to encounter highly alkaline, calcareous soils in our area, a high pH is not the only cause of iron chlorosis. Chlorosis can be confused with similar symptoms expressed by mineral deficiencies such as magnesium, manganese or boron. (Follett and Westfall, 1992).

MATERIALS AND METHODS

Preparation of *Panchakavya*

PK was prepared in our laboratory by following the classical method described in *Charakasamhita.* The raw materials namely cow dung, urine and milk were obtained from Ghir variety of indigenous cow, that is, reared in-house in the house in Keezhakkurichii. The curd and ghee were prepared by processing milk from the same source. Five hundred grams of freshly collected cow dung was mixed homogeneously with 500ml of water and the mixture was strained through a cloth. This dung extract (about 500ml), along with 500ml each of freshly collected cow urine, cow milk (boiled and cooled), and curd from cow milk (night old) were mixed with 500ml of molten cow ghee and heated on mild heat with continuous stirring. The process was continued uninterruptedly for about

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3-3.5 h till separation of phases occurred and then allowed to cool.After keeping it overnight, next day, the processing was continued on mild heat till *siddhi Lakshanas(*~process termination signs)was separated at this stage and process was continued. *Panchakavya,* an organic product has the potential to play the role of promoting growth and providing immunity in plant system. *Panchakavya* consists of nine products viz. Cow dung, cow urine, milk, curd, jaggery, ghee, banana, tender coconut and water,when suitably mixed and used.

Experimental Design

Group I: Chlorosis affected plant

Group II: Plant treated with Monochrotophos

Group III: Plant treated with *Panchakavya*

Estimation of Iron-Wond's Method

To an aliquot (6.5 ml or less) of the mineral solution (Refer food analysis), enough water is added (if necessary) to make up to a volume of 6.5 ml followed by 1.0 ml of 30% H_2SO_4 , 1.0 ml potassium persulphate solution and 1.5 ml 40% KCNS solution. The red colour that developed was measured within 20 min at 540nm.

Estimation of Magnesium

To the calcium- free filtrate added 30 ml concentration HNO_3 was added and the solution was evaporated completely on a boiling water bath. 5 ml of conc. HCL and 10 ml of water were then added and the solution was stirred well with a glass rod. It was followed by the addition of 10 ml of 10 % ammonium phosphate solution and 5 ml of 10 % sodium citrate solution and the mixture stirred well. After adding 2 or 3 drops of methyl red indicator, the solution was neutralized with the addition of 1:4 dilute ammonia. Strong ammonia (25 ml) was then added, stirred vigorously and the mixture was left to stand overnight, filtered through Whatmann No. 40 or 44 filter paper and washed to make free from chlorides using 1:10 dilute ammonia (Tested with HNO_3+ silver nitrate solution). The funnel with the precipitate on the filter paper was dried in an oven. The filter paper was then transferred to a weighed crucible (the crucible was previously heated, cooled and weighed) and shed slowly over a burner. It was then kept in a muffle furnace at 600°c for 2 hours. The contents were cooled in a desiccators and weighed to get magnesium as its pyrophosphate (Sahrawat, K.L. 2008).

Estimation of total Nitrogen- Nesslers Method

0.1ml to 0.5ml of standard solution was pipetted out into various test tubes and made up to 2ml with water. Added 1ml of nessler's reagent, 3ml of 0.2N sodium hydroxide and kept for 10 minutes. The unknown solution was also treated in the same way. The colour developed was read at 480nm and the amount of nitrogen in the sample was calculated (Sahrawat, K.L.2008).

Estimation of Protein

To a series of tubes 0.5-2.5ml of standards were taken. All the tubes were made upto 3ml with distilled water. To all the tubes, 5ml of Biuret reagent was added and incubated at 37°C for 30 minutes. The optical density was read at 540nm (Sahrawat, K.L.2008).

Estimation of Zinc

Collect 20 disks of about 20cm^2 of leaves were allowed to cut from the affected plant. Then the strips were placed in Platinum or Nickel coated dish and allowed to convert to ash, by means of placing dish over the flame. Then the ash was treated with 1N Hcl, followed by the addition of 7ml of acetate buffer, 1ml of sodium thiosulphate and stopppered with a cork and mixed by shaking kept in a shaker. The standard was also treated in the same manner. (Sahrawat, K.L.2008).

RESULTS AND DISCUSSION

Plants with chlorosis first turn yellowish green to yellow between the veins, while the veins remaining a darker green. Iron is needed to produce chlorophyll, hence its deficiency causes chlorosis. For example, iron is used in the active site of glutamyl-tRNA reductase, an enzyme needed for the formation of 5-Aminolevulinic acid which is a precursor of heme and chlorophyll.

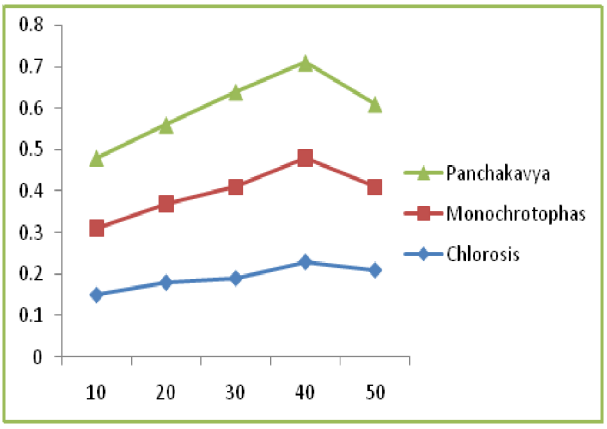

Fig.1. Effect of Iron on chlorosis leaf spot disease on *Oryza sativa L*

The level of iron in diseased plants was low and when treated with Monochrotophas the level of iron seems to be nearer to normal where as in *Panchakavya* the level of iron return backs to normal than compared with the standard drug.

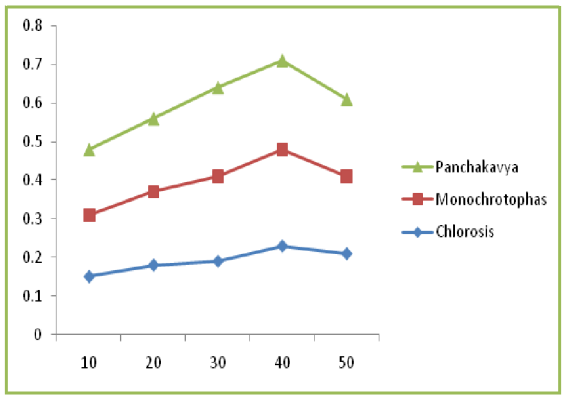

Fig.2. Effect of Magnesium on chlorosis leaf spot disease on *Oryza sativa L*

Magnesium was the central molecule in chlorophyll and was an important co-factor for the production of ATP. Mg deficiencies were not common, as Mg concentrations were sufficient in most soils. Symptoms of Mg deficiency include intervene chlorosis and leaf margins becoming yellow or reddish-purple while the midrib remains green. In paddy, distinct mottling as yellowish-green patches will occur, and alfalfa leaves may curl and have reddish undersides. Reduced Mg concentrations in foliage can lead to grass tetanic (low blood serum Mg) in animals grazing on winter (Jacobsen and Jasper, 1991). The level of magnesium in diseased plants was lower and when treated with Monochrotophas the level of magnesium seems to be higher whereas in *Panchakavya* treated plants the plant was totally free from disease.

All plants require sufficient supplies of macronutrients for healthy growth, and nitrogen (N) is a nutrient that is commonly in limited supply. Nitrogen deficiency in plants can occur when organic matter with high carbon content, such as sawdust, is added to soil. This is known as "robbing" the soil of nitrogen. All vegetables apart from nitrogen fixing legumes are prone to this disorder (Wiese, M.V. 1993).

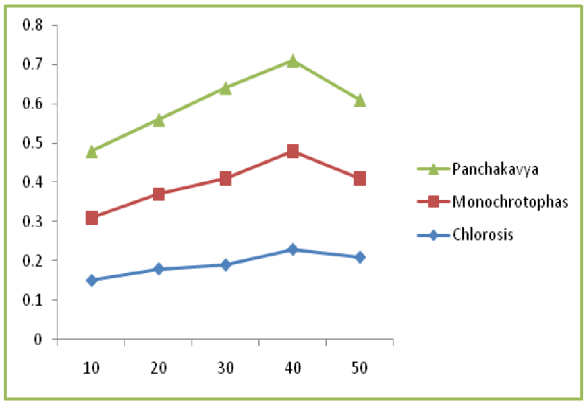

Fig.3. Effect of Nitrogen on chlorosis leaf spot disease on *Oryza sativa L*

The level of nitrogen in diseased plants was lower when treated with Monochrotophas the level of iron seems to be nearest to normal whereas in *Panchakavya* the level of iron return backs to normal than compared with the standard drug

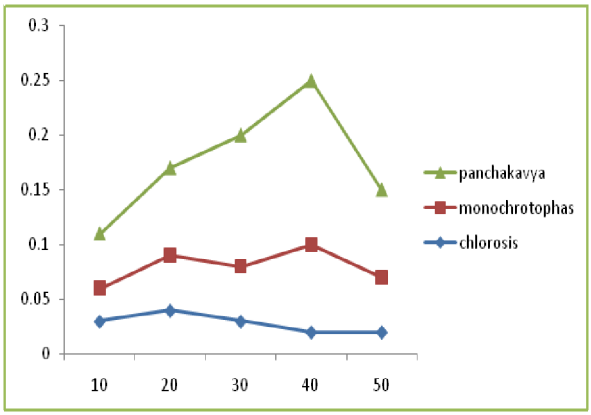

Fig.4. Effect of Protein on chlorosis leaf spot disease on *Oryza sativa L*

In paddy, yellow discoloration from the leaf tip backward in the form of a 'V' is common which indicates about the insufficient amounts of N in plants will result in few tillers, slender stalks, short heads, and grain with low protein content. Leaf curling and small tubers were common. Fields deficient in nitrogen can be either uniform or patchy in appearance, depending on the cause of the deficiency.

The level of protein in diseased plants was higher and when treated with Monochrotophas the level of protein seems to be normal whereas in *Panchakavya* treated the level of protein return backs to normal than compared with the standard drug.

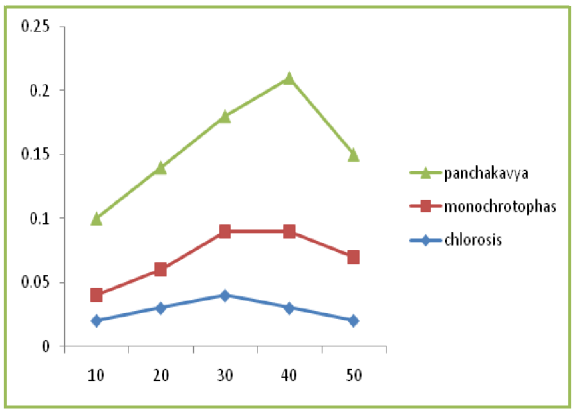

Fig.5. Effect of Zinc on chlorosis leaf spot disease on *Oryza sativa L*

Zinc is needed by plants for growth,hormone production and also important for internode elongation. As previously noted, Zn has intermediate mobility in the plant and symptoms will initially show up in middle leaves. Zn deficient leaves display

interveinal chlorosis, especially midway between the margin and midrib, producing a striping Crop specific symptoms include smaller leaf size in alfalfa, gray or bronze banding and reduced tiller production in small grains and abnormal grain formation (Wiese, 1993). Zn deficiency generally does not affect fields uniformly and deficient areas usually occur where topsoil has been removed (Follett and Westfall, 1992). The level of zinc in diseased plants is higher which is an indicator of chlorosis, in case of Monochlrotoplas treated plants the level becomes reduced, whereas in *Panchakavya* treated the Zinc becomes normal.

CONCLUSION

Nutrient deficiencies and toxicities cause crop health and productivity to decrease and could result in the appearance of unusual symptoms. Understanding the role of each essential nutrient and mobility in the plant could help to determine which nutrient is responsible for the deficiency or toxicity symptom. General deficiency symptoms include stunted growth, chlorosis, interveinal chlorosis, purple or red discoloration and necrosis..

As a diagnostic tool, visual observation can be limited by various factors, in soil or plant testing will be required to verify nutrient stress. Nonetheless, the evaluation of visual symptoms in the field is an inexpensive and quick method for detecting potential nutrient deficiencies or toxicities in crops, and learning to identify symptoms and their causes is an important skill for managing and correcting soil fertility and crop production problems. *Panchakavya* was used more effectively for treating chlorosis than Monochrotophas, which is environmental friendly.

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