

## **GREEN FARMING STRATEGIC VISION : 40**

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## **BIO-AGENTS : Eco-friendly management of phytonematodes to enhance crop production**

## Dr. D.J. PATEL\*

Ex. Principal & Dean, B.A. College of Agriculture, Anand Agricultural University, Anand - 388 110 (Gujarat) E-mail : davabhai@yahoo.com

Phytonematodes are hidden enemies of crops affecting crop production in agro ecosystems. They attack almost all agricultural and horticultural crops such as vegetables, pulses, oil seeds, cash crops such as tobacco, cotton, sugarcane, spices; cereals, all tropical and subtropical fruits crops, plantation crops, etc. in the world. Most of the efforts put forward in terms of fertilization, varietal improvement, intercultural operations etc. could not prove much effective to suppress plant parasitic nematodes (PPNs) which could lead to depreciation in quality and quantity of crop yields. PPNs induce 12-13 % yield losses in crop production worldwide accounting to approximate US Dollars 125 billion. In India, statistically estimated monetary field loss comes to about ₹ 2100 crore only in 24 crops covered under AICRP on Nematodes. Chemical control has been most effective methods for management of PPNs but only few nematicides viz., carbofuran, phorate and carbosulfan are officially registered by Government of India and are available to farmers. However, they have now not remained much effective under severe infection of nematodes in crops in open and protected cultivation. However issues of environmental concerns, health conscious attitude of human beings and other hazards are associated with use of chemicals. Use of bio-agents to suppress plant parasitic nematodes population is gaining importance. Biological control involves the use of beneficial organisms, their genes, and/or products such as metabolites that reduce negative effects of plant pathogens and promote positive responses by plant. In this path, a number of commercial products have been registered both at national and inter-national levels based on different fungal and bacterial antagonists. Good qualities of bio-nematicides are now available in the country. Since last one decade or so, bio-nematicides such as Trichoderma viride (Tv), T. harzianum (Th), Purpureocillium lilacinum (PI), Pseudomonas fluorescens (Pf), Bacillus subtilis (Bs) etc. of good quality (cfu 2x10<sup>9</sup>) are being extensively used for nematode management by farmers.

Two seasons pooled data showed that the application of Carbofuran@1kg (Furadan 3G@33 kg/ha) + 5 kg Pl/ha under the crop row a day before potato seeding checked 94% root-knot infection on potato tubers and enhanced 45% production of healthy tubers. Results of three years pooled data showed that application of PI @ 25 kg spore dust with carrier/ha(109cfu/g) either with poultry manure @ 10t/ha or mustard cake or neem cake @2t/ha improved plant growth and considerably reduced gall index and gave higher brinjal fruit yield over control (ICBR 1:5.8 to 1:18.5). Field application of PI (2 x 10<sup>6</sup> cfu/g) and Pf (2 x 10<sup>6</sup> cfu/g) each @ 2.5 kg/ha along with 2.5 t FYM/ha reduced root-knot nematode population by 32.01 and 35.67% and increased okra fresh pod yield by 92.97 and 71.24% over control. Three years pooled data indicated that seed treatment of PI @ 20 g/kg seeds coupled with Pf soil application @ 2.5 kg/ha under the crop row reduced 35.45% M. arenaria infection, 72.75% stem rot by Sclerotium rolfsii and increased 38.88 % ground nut pod yield over control. Application of bio nematicides Neemate 10 G @ 2 g a.i./plant and Samarat (FYM enriched with PI) @ 750 g a. i./plant decreased 28.74 & 27.15 % and 22.69 & 18.21 % no. of root galls and nema population/ 5 g roots and thereby increased pomegranate fruit yield by 25.38 & 21.91 %, respectively. In banana also, Neemate 10 G@ 2 g a. i./plant and Samarat @ 750 g a. i./plant could reduce 49.14 & 61.48 % lesions on rhizomes, 31.52 & 37.32 % root- knot index, 63.59 & 61.07 % nema population/ 200 g soil and 91.26 & 90.50 % nema population/5 g roots and thereby increased banana fruit yield by 37.82 & 46.98 %, respectively. Root- knot nematodes (M. incognita) on grape was effectively checked by application of Pf @ 20 kg/ha (ICBR 1:32.10) and Tv plus @ 20 kg/ha (ICBR 1: 26.64) in Maharashtra. Okra seed treatment with Tv or PI or Pf each @ 5 g/kg seeds followed by soil application of Tv or PI or Pf each @ 2.5 kg/ha 15 days after seed sowing drastically reduced M. incognita by 80.0 to 92.4 % and increased plant height by 76.8 to 83.9 % in pots. Even root dip of okra seeds for one hour in PI solution of 5 and 10 g/ liter water followed by its soil application @ 5 kg/ha reduced 25.0 & 32.8% root- knot index and increased 25.5 & 24.4 % okra yield, respectively. There was progressive increase in percent egg hatching and J2 mortality of M. incognita when concentrate cell free culture filtrate of Tv was increased from 25,50,75 and 100 % during different exposure periods from 24, 48, 72, 96 and 120 hours. It was maximum of 74.83 and 73.05 % suppression of egg hatching and J2 mortality at 120 hours of exposure, respectively. Sowing of tomato seeds treated with PI 1 % WP @ 20 g/ kg seeds in nursery soil applied with PI @ 50 gm/m<sup>2</sup> and transplanted these seedlings in field applied with 5 tons FYM/ha enriched with 5 kg Pl 1 % WP has reduced 57.5% root- knot disease and increased 23.0 % fruit yield of tomato . Application of these bio-agents enriched with good quality organic manures has given very cost effective results. Hence, there is a need to popularize use of good quality bio-agents for effective and economic management of phytonematodes in integrated management programs to enhance crop production and productivity by farmers.. They are eco-friendly and good component of organic farming as well.

\*Dr. D.J. Patel born in June 5, 1944. Graduated in B.Sc. (Agri.) with first class from B.A. College of Agriculture, Anand, Gujarat in 1967. Earned in service M.Sc. (Agri.) in 1972 and Ph.D. in 1978 in Plant Pathology (Specialization in Plant Nematology) from B.A. College of Agriculture, AAU, Anand, Gujarat. Worked in different capacities and finally retired as Principal & Dean, B. A. College of Agriculture, Anand (1997-2004). Published 237 research papers in national and international journals, 38 popular articles, 9 book chapters, 3 bulletins/folders/leaflets and 2 review papers. Received 8 awards/medals. Life / annual memberships in 22 scientific organizations. Presidents of Nematological Society of India, New Delhi & Indian Society of Mycology and Plant Pathology, Udaipur. Guided 8 M.Sc. (Agri.) and 6 Ph.D. students in Plant Nematology.