Agric. Rev., **30** (3) : 206-212 , 2009

AGRICULTURAL RESEARCH COMMUNICATION CENTRE
www.arccjournals.com / indianjournals.com

MAJOR DISEASES OF TOBACCO AND THEIR MANAGEMENT IN KARNATAKA- A REVIEW

Shamarao Jahagirdar and A.R. Hundekar

Department of Plant Pathology
University of Agricultural Sciences, Dharwad- 580 005, India

ABSTRACT

Diseases are important production constraints in tobacco growing environments of the country. Management of these diseases help in both quantitative and qualitative enhancement of tobacco yields. In present paper, information has been reviewed on various aspects of different economically important diseases of tobacco in Karnataka and different management options including Integrated Disease Management strategies.

Key words: Tobacco diseases, Nursery, Main field, Integrated disease management.

I. Introduction and economic importance:

Introduced in India by the Portuguese in 16th Century, tobacco cultivation has become a way of life as well as an industry and has made great strides. While playing a key role in Indian economy despite its social disapproval due to its alleged association with human health, tobacco has thrived well. India occupies second place in area and third place in production accounting for 10% of world's area and about 9% of tobacco production by using just 0.3% arable land. India is one of the leading exporters of tobacco occupying fourth place in overall exports and ranks fifth in the export of FCV tobacco after Brazil, Zimbabwe, China and USA. The country accounts for about 5% and 0.7% of world tobacco import export trade by volume and value respectively. It accounts for 4% (204 million US Dollars) of India's agricultural exports and 12% (Rs.8182 crores) of total excise revenue. Further, it is livelihood of about 35 million people including 6 million farmers as well as others in direct or indirect manner (Anonymous., 2004).

India produces about 550 million kg of tobacco in an area of 0.4 million ha. with a production of 7 lakh tonnes annually. Andhra Pradesh, Gujarat and Karnataka are important tobacco growing states. In Karnataka, the principal types of FCV (about 70,000 ha) and bidi tobacco (about 20,000 ha) are grown with good quality leaf, of which the former is raised as a monsoon crop on light soil areas of Southern transition zone of Mysore, Hassan, Shimoga and Chikkamagalur districts, while the latter is grown as a rain fed crop mainly on heavy to medium soils of Nipani tract of Belgaum districts, dependent on conserved soil moisture.

II. Major diseases in nuresry and main field

The tobacco environment has often provided ideal conditions for spread and multiplication of organisms which are later adapted as tobacco parasites. The pests have

E mail:- shamaraoj@gmail.com

become a major production constraint in tobacco cultivation. Both bidi and FCV tobacco are affected by several diseases in nursery and transplanted crop. The loss due to these diseases is about 5 to 15 per cent depending on their intensity. The losses can be minimised by taking timely preventive and curative management practices. The foliar diseases even with low intensity can considerably reduce the value of the final produce in the market. The management practices developed should also consider the use of safer pesticides so as to avoid the residual problems.

Damping off, nematodes, black shank, bacterial wilt, mosaic and tomato spotted wilt virus are some of the major constraint for raising healthy and more number of transplanting seedlings from nursery. The other major diseases prevalent in the main field are, root knot nematode, frog eye leaf spot, black shank, brown leaf spot, tobacco mosaic virus and leaf curl.

III. Diseases of FCV Tobacco

a) Diseases in nursery

Damping-off, leaf blight and black shank are the major fungal diseases. Severity of anthracnose and frog-eye spot diseases caused by fungal organism depends on seasonal weather factors. Damping-off caused by *Pythium aphanidermatum* (Edson) Fitz. and *P. myriotylum* (Dreschsler) is one of the most severe diseases in KLS nurseries causing even up to 100% damage to the seed beds under favourable conditions such as warm temperature, high humidity and excessive moisture (Shankar Bhat *et al.*,1991). Leaf blight and black shank are caused by different inoculum propagules of soil borne fungal pathogen, *Phytophthora parasitica* var. *nicotianae*. Anthracnose disease caused by *Collectrichum tabacum* makes its appearance after rains and spreads very fast under a set of conditions which include less number of sunshine hours per day, drizzling rains and high RH in the night. Frog-eye spot disease caused by *Cercospora nicotianae* also appears in nursery at later stages as leave attain physiological maturity.

Root-knot disease caused by *Meloidogyne* spp. is the serious and wide spread disease in entire KLS. An extensive survey in KLS revealed the presence of four species of *Meloidogyne viz.*, *M. incognita, M. javanica, M. arenaria* and *M. thamesi*. Yield losses due to root knot infection at nursery stage has been quantified (Karunakarmurthy *et al.*, 1999)

b) Management strategies in nursery

Seed treatment with metalaxyl (Apron 35 SD @ 3% slurry) followed by soil drenching at 0.02% concentration or three drenchings of Captafol 80 WP at 0.2% concentration effectively controlled damping-off disease. Mycorrhiza @ 1 kg/m2, oxadixyl (SAN 518 F at 0.2%) and metalaxyl (Ridomil 25 WP at 0.02%) and groundnut shells @ 2 kg/ m2 were found as effective as copper oxychloride (0.2%) in the management of damping-off in FCV tobacco nursery. Soil solarization for 4 weeks during summer months coupled with application of neem cake @ 400 g/ m2 followed by one spray of 0.2% Ridomil MZ 72 WP proved effective against damping-off (76.9%) in nursery and resulted in significantly higher number of healthy transplants(Reddy *et al.*,2006).

Ridomil MZ 72 WP at 0.2% concentration as basal drenching @ 500 ml/ m2 bed and three sprays at 15th, 30th and 45th days after sowing proved superiority in controlling damping-off blight and black shank diseases (Shenoi *et al.*,1992). The prevailing race of black shank pathogen in Shimoga area is 'O' (i.e., *Phytophthora nicotianae* var. *nicotianae)*.

Phenamiphos @ 10 l or kg/ha proved effective for management of root-knot

nematode disease. Soil solarization of FCV nursery tobacco beds for 4 weeks with clear plastic film of 100 gauge (25 um) during summer months in conjunction with neem cake @ 200 g/ m^2 or poultry manure @ 100 g/ m^2 resulted in maximum yield of transplants with minimum root-knot index (Reddy *et al.*,2006).

Soil solarization for 4 weeks + neem cake (400g/m2) +Ridomil MZ 72 WP (0.2%) has been recommended for management of damping off in tobacco nursery in Shimoga area (Narayanswamy *et al.*, 2004). Among integrated management strategies, solar tarping for 2 weeks + neem cake application has been advocated for root knot nematode. Integration of botanicals such as Pongamia,Eucaylptus and Ipomea @1kg per sq.mt +soil solarization for two weeks has been recommended for root knot nematode in nursery in Shimoga area (Ravindra *et al.*,2001).Sealing methods along with basamid application did not have any adverse effects and helped in effective management of root knot nematode in nursery (Ramakrishnan *et al.*,2002) . In an effort to develop integrated strategies for nematodes in nursery ,application of poultry manure(100g/m^2)+ soil solarization for 4 weeks has been standardized (Ravindra *et al.*,2003)

Apron 35 SD drench in combination with either Apron slurry or *Trichoderma* @ 100 g/m^2 was highly effective in controlling damping-off and black shank diseases in FCV tobacco nurseries. Apron 35 SD @ 0.2% drench at sowing followed by regular drenching with Bordeaux mixture was very effective in controlling damping-off, blight and black shank diseases. Soil drench with Procida stabilized Bordeaux mixture at 1.0% followed by application of the same chemical at 0.4% as and when required was at par with recommended schedule of conventional Bordeaux mixture or Ridomil MZ application in control of damping-off, blight and black shank diseases in nursery. Tilt has been identified as effective molecule for the management of anthracnose in nursery (Shenoi *et al.*, 2004). Ebufos 10G, Hoe 388 5G, Phenamiphos 5G at 1 to 4 kg a.i./ha as well as Durofume @ 18ml/m^2 were found efficient in reducing root-knot index in nursery and increasing healthy transplantable seedlings. Soil solarization with 50 gauge LDPE sheets for 4 weeks + Carbofuran @ 6 kg a.i./ha in nursery significantly controlled root-knot disease and increased healthy transplant yield (Reddy *et al.*,2006).

c) Diseases in field crop

Black shank, frog-eye spot, powdery mildew and brown spot caused by fungi, TMV leaf curl, rosette and ring spot caused by virus and root-knot caused by nematodes are the various diseases encountered in the field crop of Karnataka Light Soils (KLS) region. Certain storage molds have also been studied at Hunsur center.*Aspergilli* was most predominant storage mold (>80%) in different auction plat forms (Shenoi *et al.*, 1992) followed by *Curvularia*, *Fusarium, Mucor, Rhizopus* etc. The quantification in yield and quality loss revealed 75% seed yield due to severe infections due to brown leaf spot pathogen, conversely there is increase in nicotine content in leaf and reduction in reducing sugars (Shenoi *et al.*, 1992).*Fusarium* wilt has been reported in severe form from KLS region and Carbendazim & Copper hydroxide have been advocated for the management (Shenoi *et al.*, 2002)

d) Management strategies in field crop

Foltaf, Tilt, Score and Indofil M-45 have been identified as effective molecules against brown leaf spot of FCV tobacco in KLS region(Reddy *et al.*,2006). Black shank can be managed effectively by application of Ridomil as plant hole application @150ml per hole followed by spray @0.1%(Shamarao Jahagirdar,2008)

Bayleton at 0.02% was found effective in the management of powdery mildew disease of FCV tobacco. Pongamia cake @ 30 g/plant gave maximum green and cured leaf yields with moderate root-knot index (Reddy *et al.*, 2006).

Summer ploughing and removal of stubbles after crop reduced root-knot nematode population in soil. Bajra, jowar and maize as border crops were found effective in harbouring predators of aphids. Best integrated module identified for aphid management was bajra or jowar as border crop with only one spray of imidacloprid. A separate scale was developed for brown leaf spot disease scoring in field conditions (0-7 scale) routinely by all the pathological scorings in FCV tobacco (Shenoi *et al.*, 2002). In an effort to identify the resistant sources against brown leaf spot Beinhart 1000-1 has been identified as good source and nature of resistance followed duplicate gene action (Subramanya *et al*, 2004). Among community structure of plant parasitic nematodes associated with FCV tobacco in KLS region exhibited predominance of *Meloidogyne* spp,*Rotylenchus reniformis*, *Tylenchus* spp and *Practylenchus* spp (Ramakrishnan *et al.*,2002).The severe occurrence of root knot nematode predisposed the plants for brown leaf spot in KLS region (Sreenivasa and Shenoi,2002). About 236 lines screened for TMV, 36 lines showed hyper sensitive reaction and line FCH 6248 was tolerant to TMV infection (23).KST 19 has been identified as new variety tolerant to black shank and root knot nematode in KLS region (Reddy *et al.*, 2006).

IV) Diseases of Bidi tobacco

Damping-off is the major disease in nursery. Root-knot, leaf curl, frog-eye spot and mosaic are the major diseases in the filed crop of Nipani tract. Aphid and leaf eating caterpillars are major insect pests on bidi tobacco in Nipani area (Anonymous.,2004).

a)Salient research findings for disease management

i)Damping-off: Higher seed rate (> 4 kg/ ha) in nursery led to incidence of higher damping-off disease in nursery. Metalaxyl MZ 72 WP (Ridomil) at 0.2% concentration was found very effective in management of damping-off disease and in getting maximum transplantable seedlings in nursery. Soil application of *Trichoderma harzianum* alone was ineffective in managing the damping-off disease. Metalaxyl M (4%)+ Mancozeb (64%) WP @ 0.25% at weekly interval has been found effective against damping off in bidi tobacco nursery in Nipani area(Reddy *et al.*, 2006 and Shamarao Jahagirdar,2008).

ii)Frog-eye spot: Carbendazim 50 WP at 0.05%, Thiophanate methyl 70 WP at 0.2%, Propiconazole 25% E.C. at 0.1% and Hexaconazoe 5% E.C. at 0.1% concentration were found effective for the management of tobacco frog-eye leaf spot disease(Shamarao Jahagirdar,2008 and Pairashi *et al.*,2007).Bhavyshree (NPN 22) and NBD-43 was found to be more tolerant to frog-eye leaf spot disease compared to A-119 and PL 5(Bhat.,1998 and Reddy *et al.*, 2006) and growth of *Cercospora* nicotianae on different media with variability in cultural characters was reported by Pairashi and Shamarao Jahagirdar et al, 2007. Pairashi *et al.*, (2007) revealed the role of PGPR components in assessment economic and quality parameters in bidi tobacco.

iii)Root-knot: The germplasm line (A 2 x Olar) 655-27-38-39 was found to be immune and five germplasm ines were found to be resistant to root-knot nematodes. All the bidi tobacco varieties released so far have shown susceptible reaction to the root-knot nematodes. Poultry manure at 20 t/ha, Ebufos 10G at 1 kg a.i./ha and sunhemp green manuring was more effective in reducing root-knot nematode and increasing bidi tobacco

leaf yields. Application of poultry manures @ 1 t/ha mixed with Carbofuran 3G @ 5 kg/ha to planting hill at the time of transplanting was also effective for the management of root-knot nematodes. Poultry manure @ 10t/ha broadcasted 15 to 20 days before planting of tobacco was found to be effective, practicable and economical for the management of root-knot nematode in bidi tobacco under Nipani conditions (Hundekar and Baht, 2001:, Hundekar *et al.*,2005: Shamarao Jahagirdar *et al*,2007, Shamarao Jahagirdar and Hundekar,2007a and 2007b). Among new molecules screened against root knot nematode,Abamection@4ml/lit seedling dip has been found effective.

V) Integrated Disease Management:

The IDM for damping off includes (I) deep ploughing in the nursery during summer, (II) raised beds of 15 cm height, 10 mt. length and 1 mt width to avoid water stagnation, (III) rabbing (burning) the prepared seed beds before sowing with paddy husk, bajra crops, or sugarcane trash at 6 kg/sq.mt (IV) Drenching the seed bed before one day sowing with 0.5% Bordeaux mixture or 0.2% copper oxychloride (V) Use of optimum seed rate of 0..5 g/sq mt. (VI) Avoid excess application of water (VII) Periodical spraying of Bordeaux mixture (0.5%) or copper oxychloride(0.2%) or Metalaxyl MZ 72 W.P (0.2%) starting from second week after sowing. The number of applications generally depends on the prevailing weather situation during the season.

The centre has also developed IPM strategies for management of major diseases in the main field. The IPM strategies for the management of the black shank, root knot, tobacco mosaic virus and brown leaf spot are (I) Deep ploughing in summer helps to destroy the over wintering population of *phytophthora*, eggs and larva of nematodes. (II) Field sanitation such as removal of the infected plants, collateral hosts for the management of virus diseases. (III) Cultivation of multiple disease tolerant varieties like Bhagyshree and Bhavyashree for tackling the problem of black shank, root knot and frog *eye* leaf spot. (IV) Strict crop husbandry practices such as rotation, avoiding excessive stagnation of water, removal of alternate and weed hosts would help in management of these diseases. (V) Spot application of poultry manure 1t/ha + Carbofuran 5 kg/ha has been identified as the best delivery system for the management of root knot nematode in recent years. (VI) Spraying with carbendazim at 0.05% is advocated against frog *eye* leaf spot especially during the month of November and December. The above said IPM strategies however, need a time tested large scale validation to fine tune the programme of IPM of tobacco.

VI.The Future Thrust Areas for Management of Tobacco Diseases:

The diseases of tobacco are often being influenced by the environmental factors (both internal and external). Though the epidemiology of these diseases has been studied elsewhere, there is a need to study in depth about the role of each of the weather parameters that influence significantly the initiation, development, peak and decline of disease especially the foliar diseases. Such studies would further help in working out the lead periods for each foliar disease and to develop suitable warning systems so as to advice the farmers in taking up timely plant protection measures. There is a need to map out the prevailing pathotypes/ races of *phytophthora,* association of species of nematodes especially *meloidoygne* in each of the tobacco growing environments. These findings would further help in planning the resistance breeding programme using biotech tools for a target disease/ pests, race/ pathotype prevalent in that area/ region.

It is urged that the growers identify the disease problems in their fields and

follow disease management suggestions based on rotation, variety selection and chemical treatments. A sound disease management strategy cannot be developed without proper identification of the disease in the field. Disease development is a dynamic process and can change overtime. Low disease losses in the recent past do not assure that the losses remain low in future. Under such changing environments there is a need to monitor the resistance level of the varieties, development of new strains of pathogen as well as their population dynamics. The changes in tobacco programme have made crop productivity and leaf quality essential for economics success. Hence, development of a sound pest management programme will be corner stone of successful farm operation in future.

REFERENCE

Anonymous (2004). Annual Report, Central Tobacco Research Institute of Rajahmundry.

Anonymous (2004). Annual Report, AINRP(T) ,Agril.Research Station,Nipani.155pp.

Bhat, B. N. (1998). Published by Directorate of Research, UAS, Dharwad 57pp

Bhat. B.N. *et al*. (2001). *Tobacco Res,* **29**:1-4.

Hundekar.A.R.*et al*. (2001). *Tobacco Res*, **27** (1): 37-40.

Hundekar. A.R. *et al*. (2005). *Tobacco Res*, **31** (1&2):86-90.

Karunakarmurthy, *et al*. (1999). *Tobacco Res*, **25** (2):92-94

Karunakarmurthy, K. and Shenoi, M. M. (2001). *Tobacco Res*, **27** (1):1-6

Karunakamurthy, K. *et al*. (2003). *Tobacco Res*, **29** (2):80-87.

Pairashi, M. I. and Shamarao Jahagirdar (2007). *Tobacco Res*, **33** (1&2):100-101.

Pairashi, M. I. *et al*. (2007), *Tobacco Res* **33** (1&2):102-104.

Narayanswamy, H. *et al*. (1998). *Tobacco Res*, **24** (2): 106-108.

Narayanswamy, H. *et al*. (2004). *Toabcco Res*, **30** (1):16-21

Reddy, P.R.S. *et al*. (2006). Central Tobacco Research Institute, Rajahmundry.71pp.

Ravindra, H., *et al*. (2001). *Tobacco Res*, **27** (4): 19-23

Ravindra,H. *et al*. (2003). *Tobacco Res*, **29** (2):1-7-109

Ramakrishnan, S. (2002). *Tobacco Res*, **28** (1):10-14

Ravindra, H. (2003). *Tobacco Res*, **29** (2): 103-106.

Shankar Bhat, S. *et al*. (1991). *Tobacco Res*, **17** (1): 45-46

Shamarao Jahagirdar *et al*. (2007). Department of Biological Science Rani Durgavati University Jabalpur.

Shamarao Jahagirdar and Hundekar, A.R. (2007a). Gadjah Mada University, Indonesia from 20-24,August,2007.344pp.

Shamarao Jahagirdar and Hundekar, A.R. (2007b) *Indian J Plant Protection*, **35** (2):329-330.

Shamarao Jahagirdar, *et al*. (2007). In: National Symp on Plant Pathogen: Exploitation and Management Department of Biological Science Rani Durgavati University Jabalpur.

Shamarao Jahagirdar and Hundekar, (2008). In Proc First International Conference on Agrochemicals Protecting Crop, Health and Environment held at IARI, New Delhi from 8-11, January, 2008. 327pp.

Shamarao Jahagirdar, (2008). In: 9th International Congress on Plant Pathology (ICPP-2008) held at University of Torino, Italy from 24-29th August,2008.

Shenoi. M. M. *et al.* (1992). *Tobacco Res*, **18** (1&2): 93-96.

Shenoi, M. M. *et al.* (2002). *Tobacco Res*, **28** (1):65-71

Shenoi, M. M. *et al.* (2002). *Tobacco Res*, **28** (2):142-145

Shenoi, M. M. *et al.* (2004). *Toabcco Res*, **30** (1):27-32

Sreenivasa. S and Shenoi. M. M. (2004). *Tobacco Res*, **30** (1): 99-103

Subramanya. K. N. *et al.* (2004). *Tobacco Res*, **30** (2):118-122.