SUMARY

Potatoes are a major world crop and potato cyst nematode *Globodera rostochiensis* Wollenweber and *Globodera pallida* Stone are associated specialist parasites of this crop of worldwide significance. Potato cyst nematodes, by their small size and cryptic nature within large soil masses, by their extreme specialism and intimate association with their host, and by their amazing adaptation for long-term survival in the soil in the absence of a suitable host, present formidable problems for farmers in many of the world´s major areas of potato production. Potato cyst nematodes have proved to be highly adaptable at exploiting new environments, being transported passively and often undetected around the globe in intimate association with the tubers of their host, the potato.

In the I-st chapter it was present potato importance and potato areas spread in Romania and topical interest of this study from scientific and practical point of view.

Historical research of potato cyst nematodes in the world and in our contry was presented in the II-ed chapter of the thesis. The potato cyst nematodes are two very closely related species, *Globodera rostochiensis* Wollenweber and *Globodera pallida* Stone, which co-evolved with the potato in South America several hundred thousand years ago (Stone, 1979). The distribution of the two potato cyst nematodes in South America is not uniform. Evans et al. (1975) found Globodera rostochiensis predominant south of latitude 15,6º S in the Peruvian and Bolivian Andes, with only *Globodera pallida* north of this latitude. Potato cyst nematodes have been reported in 65 countries (EPPO, 1994) with *Globodera rostochiensis* in all countries and *Globodera pallida* within 41 of these.

The first research worker which recognized the morphological differece between *Heterodera schachtii* Schmidt and *Globodera spp*. was Wollenweber (1923). *Globodera* genus was named for the first time by Skarbilovich (1959) and this name was confirmed by Behrens (1975).

In Romania the *Globodera* genus was recorded for the first time in the 1984 year by Rojancovschi and Deheleanu (1986) near the Lăzarea place from Harghita district. From 1984 when *Globodera* was detected for the first time and at present the districts number with this pest was enlarge and now there are 6 districts with 28 focus fields and the total surface is about 854 ha with *Globodera rostochiensis* Wollenweber and *Globodera pallida* Stone.

In the III –ed chapter it was presented the purpose, objectives and methods of research of the working and studies effectuated on morphology, biology and ecology of potato cyst nematodes. The samplig soils was made concerning both European Plant Protection Organization and National legislation standards. With a view to soil sampling I used zig-zag method and I took a soil sampling about 400g average from 5000 m² fied and 5 cm depth. The places from were took the soil sampling, the surfaces were studied and the number of soil sampling and types of surveillance were presentated in paper.

Sampling agricultural land prior to planting potatoes usually forms the basis of estimating levels of potato cyst nematodes populations for certification, advisory and research programmes. Advisory programmes are an essential condition to determine potato cyst nematodes population density and spread and to take best decisions in accordance with legislations, ex. growing the resistant potato race, using nematocides etc. Many country using different ougers to take an variable cores of soil per field. The European Plant Protection Organization (EPPO) recommended to take a number of soil sampling of 100 cores (4,5 ml volum each of them) from 5 cm depth. Perry (1996) concluded that the sampling pattern may indeed be an important determinant of the success in detecting nematode infestations and that the zig-zag plan should be adopted in preference to the perimeter plan, as it represents as much of the field as possible, and increases the chance of detecting infestations over a range of levels of aggregation.

The method chosen has to consider predominant soil types, available facilities, the reason for the extraction, the accuracy required, e.g. statutory sampling requirements and standards, and the need to process samples and maintain potato cyst nematodes populations in culture, e.g. for resistance screening and research.

To understand ultrastructure and morphology of potato cyst nematodes is very important for efficiency utilization of control tactics of this species and to develop the new tactics.

The female of this four genus turn into a cyst with dead cuticle that help to protect both eggs and the second stage juvenile which are contain interior of the body cyst. The second infectiv juvenile of cyst nematodes is vermiform and can remain in shell egg from female dead cuticle

between several months to several years. The males emerge mechanics from cuticle of the third juvenile stage with stylet help and they are attract by feromone of mature female.

The body cyst nematodes are divided into three distinc parts- head, trunk and taile- all are covered with a resistant and flexible cuticle sometimes this cuticle are decorate or ring-shaped. The body of this nematodes are transparent and have bilateral symmetry; the body segmentation are superficial and are limited only cuticle. The cuticle covered all the nematod body and lining sensorial opening, esophagus, secretory-excretory duct, rect and reproductive system of male and female. The digestive system for all stages of cyst nematodes consist of many parts like: oral oriffice or mouth- a stomatic cavity armed with a stylet- oesophagus that include procorpus, median bulb and a dorsal oesophagial cellular gland and two subventral glands cellular, the intestine, the rectum and anal oriffice. The reproductive system of second stage juvenile from *Globodera* species consists from 4 cells (2 big cells and 2 cells primordium) and eggs. The male system reproductive consists from one testicle, deferential vessel, copulative organ and anal-genital oriffice. The sensorial function and motric control are the principals functions of nervous system. The excretory system consists from a monocellular structure that have a excretory gland or an simple or tubular duct which are finish with an excretory por.

The life cycle of *Globodera spp.* is tipical for this genus. The adult stage and reproduction of this genus are only after three moulting. In the same chapter it was presented cyst nematodes ecology respective soil influence and chemical compozition of the soil, water influence, host plant influence, survivals strategy of cyst nematodes and population dynamics of cyst nematodes. The cyst nematode although circumstantial we can find on parts of plants above the soil, they are organisms that live in soil. Many critics stages of life cycle (survival, hatch, host localization, moving, host penetrate and mating) are under chemical, biologycal and physics influences of environment. Wallace (1963) demonstrated that best humidity content from sands, clay, peat soil for moving *Globodera rostochiensis* Wollenweber species is field capacity content. The temperature have an important role to determine efficiency factors of hatching. Root plant penetrate and stabilized the place for feeding initiation parasite stage from life cycle from cyst nematodes. A plant that are not good host for a characteristic nematod species can have a neutru or negative impact for population level of cyst nematodes. The same thing a resistant plant will have an neutru or negative impact concerning cyst nematodes density. Another aspect of cyst nematodes biology that emphasis the importance like parasits is their ability to survive long periods in absence of host plant. When population density is low and interspecific contest is minimum, the population will increase to maximum.

The main species of nematodes recorded in our country was descriebed in the IV-th chapter , respectively golden cyst nematodes (*Globodera rostochiensis* Wollenweber and *Globodera pallida* Stone and stem and tuber nematodes (*Ditylenchus destructor* Thorne, 1945). For each of them it was presented in great detail:

- systematic and synonym;
- spread in the world and in our country;
- description of development stages;
- biology and ecology of this nematodes;
- plants attack and injurious mode;
- preventions and control measures of this nematodes;

In the V-th chapter it was present vertical and orizontal distribution of potato cyst nematodes and tolerant and resistant potato varieties at potato cyst nematodes attack. Potato cyst nematodes are not spread all the field like *Heterodera schachtii* Schmidt species. Following an initial infestation at one (or more than one) point in the field, the infestation, or focus, spreads in a patch manner, give rise to secondary foci (sometimes refered to as lens), which themselves spread similarly (Jones and Kempton, 1978; Jones and Perry, 1978). Potato cyst nematodes were often numerous at 20-40 cm depth as in the top 20 cm of soil, but were uncommon below 40 cm. In growing potato crop, the density of potato cyst nematodes will greatest around the roots after hand-harvesting (e.g. in experimental plots), the density will be greatest directly beneath the rows. Southey (1974) showed that there is theoretically a 95% chance of detecting a density of three cysts per sample.

Toxeopus and Huijsman (1953) identified in 1963 the H1 gene in *Solanum tuberosum* that confers resistance to *Globodera rostochiensis* Wollenweber. Dunnett (1957; 1963) identified the major gene H2 in the wild diploid species *Solanum multidissectum*, but it was only effective against *Globodera pallida Pa1*. The transfer of resistance and its incorporation into agronomically acceplable cultivars is greatly influenced by the mode of inheritance of the resistance and the genetic back-ground of the source of resistance. The cultivars *Sante´*, from the Neteherlands, and *Nadine*, from Scotland, also have *Globodera pallida* Stone resistance derived from *Solanum vernei*. Tolerant cultivar *Cara* lost an average 13% of its expected yield through damage but cultivar *Pentland Dell*, classed as intolerant, lost 34% of its potential yield.

Principles extraction of potato cyst nematodes and results obtained between 2001-2006 was presented in the VI -th chapter. The soil sampling took between 2001-2003 both Suceava and Bistrița-Năsăud was process by Fenwick Can method and the soil sampling took between 2004-2006

was process by Schuiling and Arvo column. The cyst of *Globodera spp*. was pick off from filter paper with an needle and a brush.

After extraction soil sampling with Fenwick Can and Schuiling methods the results obtained were presented in paper. With a wiew to the identified potato cyst nematodes species, respectively *Globodera rostochiensis* Wollenweber and *Globodera pallida* Stone, which was obtained after extraction process it was used an operation manner which was detailed it in thesis, and the results which was obtained were presented in the paper. Although it is possible to prepare all satges of the potato cyst nematodes life cycle for microscopic examination, in practice the second juvenile stage (J2) and cyst characters are usually examined for species identification.

After reserches effectuated in potato cultures from Suceava and Bistrița-Năsăud it was recorded the next species of potato cyst nematodes: *Globodera rostochiensis* Wolenweber and *Globoderas pallida* Stone.

The ratio between species detected was 106 : 31, more in *Globodera rostochiensis* Wolenweber favour and viability of juvenile content was 10 – 60%.

The total area which was detected the two species of potato cyst nematodes was 32 ha in Suceava departament and 19 ha in Bistrița-Năsăud departament.

For the first time in 2005 it was recorded in Bistrița-Năsăud departament the presence of a new species of cyst nematodes from *Punctodera* genus.

In the VII-th chapter was presented integrated control of potato cyst nematodes, control options for potato cyst nematodes. Control of nematode pests of plants can be in a variety of ways and these are each briefly reviewed here. In practical terms “control” of plant parasitic nematodes refers to the suppression of the target species population density to an acceplable level.

Intensive research has been undertaken in the last years into various possible manner to find some methods of combating potato cyst nematodes. On the one hand, potato cyst nematodes has been attacked in the soil by means chemical and by artificial hatching stimulants. On the other hand, attempts have been made to help the potato to resist disease by stimulation with fertilizers, by cultivation methods, and by a search for immune varieties.

Control measures which, to a greater or lesser extent, have been successful against potato cyst nematodes are: crop rotations; resistant and tolerant cultivars of potato; nematocides; soil sterilization; integrated control; and biological control (which is not yet practical). Potato cyst nematodes are best controlled when two or more effective control measures are used together. Repeated use of a single control measure is likely to fail, sooner or later, due to the selection of more persistent populations of the nematode.

Crop rotation and *Globodera rostochiensis* Wollenweber resistant potatoes alternating with susceptible potatoes was found successful and soil fumigation was added to permit very short rotations for starchy potato production in Netherlands (Nollen and Mulder, 1970).

Integrated control is harder to achieve for *Globodera pallida* Stone than for *Globodera rostochiensis* Wollenwerber, because *Globodera pallida* Stone may decline more slowly under non-host crops, there are relatively few useful cultivars resistant to it and than resistance is only partial, and granular nematicides are less effective in controlling its multiplication.

In the VIII-th chapter it was presented generale conclusions and some recomandations after this study.