Myths develop for many reasons, but one principle reason is a lack of understanding of some natural phenomena. Nematodes are ripe territory for “accepted fact” being far from the known science and it is with good reason that they are labeled “THE UNSEEN AND FORGOTTEN ENEMY”. The previous four articles have attempted to remove some myths and achieve a greater understanding of how nematodes influence potato production. This article focuses on providing more insight into the habits of overwhelmingly the major nematode problem on potatoes in South Africa, namely the Meloidogyne species, Root-knot nematode, (RKN) and how these habits influence any control strategy. RKN was estimated in 1989 to cause losses of 16.7% of production valued at R55.2 million, but this understates the impact on individual producers who can suffer a total loss.

The symptoms of RKN damage are as illustrated in Figures 1 to 3.

Typically RKN are lumped under a single heading but seven species of RKN have been isolated from potatoes in South Africa. M incognita MI and M javanica MJ are the most widespread and damaging. MI is present in 72% of populations, MJ in 62% and 40% are mixed populations. Two additional species have recently been recorded, M chitwoodi MC, isolated from severely damaged tubers in KZN and the E Cape and M fallax MF recorded only from Vaalharts. These two species must be noted because:
in other countries they are serious pests of potatoes,
their ecological habits differ from MI and MJ,
their distribution in SA is poorly understood, and
control strategies outside South Africa differ from locally used strategies to control MI and MJ.

The damage caused by RKN starts with the second stage juvenile hatching from an egg and invading a root or tuber. The juvenile penetrates deep into the root or tuber where it induces cell multiplication. This leads to the formation of galled roots and the swellings on potato tubers. The nematode also induces the formation of a feeding site which acts to transfer nutrients to the nematode. Basically the nematode re-directs the flow of nutrients from foliage and minerals and water resources from roots. The juvenile develops after about 20 days time into a sedentary female that soon begins laying eggs. One female can lay between 400 and 1000 eggs and the egg to egg cycle at 25°C takes about 30 days. Thus if roots become infested early, several generations can occur before lifting.

The resultant damage depends on the abundance of the pest. If a high population is present at planting, potato roots will be invaded (figure 2) and above ground symptoms are typically that of an unhealthy root system, stunted growth, yellow foliage, premature wilting etc. Such symptoms are rare because at planting populations are generally low and the subsequent root damage is often only slight or absent. But by the time tubers are initiated, eggs from any root infestation will hatch and readily invade the developing tubers and the typical symptoms appear immediately.

If this infestation occurs early, a high % of tubers will be severely blemished resulting in the downgrading and market rejection of the crop. If the crop has been grown for seed, the crop will be rejected if a 0.5% infestation is present.

RKN control

RKN control is all about reducing the population to very low levels between crops. This is achieved by depriving RKN of hosts and manipulating the environment to enhance decline in numbers. Regrettably both MI and MJ infest a wide range of crops, weeds and indigenous plants. For this reason control by crop rotation is difficult to achieve, especially in intensively farmed soils but planning a suitable rotation is of critical importance. Abundance is also affected by non host environmental factors. Three key factors are involved.

- Firstly temperature

The egg to egg cycle and egg laying rate is influenced by temperature. For MI and MJ, development virtually stops at 15°C whereas it is rapid between 20 and 30°C and again virtually stops above 35°C. Thus if plantings are done in late spring, damage potential is greatest, whereas early spring or late autumn plantings are less likely to be damaged. Likewise this partially explains why damage is more severe in the Northern Cape and the Sandveld than other production regions.

This situation has been compromised by the identification of MC which is much more tolerant of low temperatures and is active down to 5°C. Thus the optimal planting cycle to avoid damage will differ.

- Secondly soil type

RKN juveniles can only migrate in pre-existing soil pores, thus pest populations establish more readily in light sandy soils. Poorly structured soils above 20% clay are not likely to be severely infested with RKN because the environment is unsuited to RKN build up. Again this helps explain why RKN problems are most severe in the Northern Cape and the Sandveld and considerable less critical in KZN.

- Thirdly rainfall and irrigation

Nematodes are aquatic animals, and the moisture status of the soil strongly influences their survival. Allowing soil to dry out thoroughly before planting is part of an effective RKN control strategy.

Thus the main steps of an effective control programme are

1. Grow the crop quickly and harvest as early as possible. This not only protects the current crop but reduces the infestation burden of any subsequent crop.

2. Remove unharvested tubers, destroy crop residues and kill volunteer plants. Potatoes are typically the most favourable crop in the rotation for RKN build up thus if the previous potato crop is not totally destroyed any other practice will have limited value.

3. Plant potatoes after as long a rotation of poor hosts as possible, a minimum of 4 years are recommended.

4. Avoid other favourable crops especially prior to potatoes. Most vegetables fall in this grouping as does cotton and maize. Small grain cereals are probably the best crops to assist in population reduction. Obviously, if pastures can be planted, the nematode resistant grass types are the best option.

5. Allow the soil surface to dry out thoroughly before planting. Dry hot soil with no crop cover is a very unfavourable environment for RKN.
6. Plant only with clean seed. Introducing the infestation at plant is the first step towards a crop failure.

7. Plant if possible in times when conditions are unfavourable for the build up of RKN populations. This differs with regions but essentially utilize times when temperatures are low especially after tuber initiation.

8. Adopt a chemical control programme that is based on up front preventive control. Nematodes are far more easily controlled preventatively than curatively. Read the product label and follow recommendations.

9. Lift as soon as possible.