

The Plant Industries NT Newsletter

June 2011

Bringing relevant information to the NT's farming sector

Dear Reader,



Welcome to the inaugural issue of the Plant Industries NT Newsletter, a publication dedicated to bringing relevant and timely information to NT farmers and their service providers across their respective industries. My name is Warren Hunt and I am the new Industry Development and Extension Leader with the Department of Resources (DoR). This newsletter has been initiated to provide a regular link between the department and the farming sector. Its aims are to provide up to date and targeted information that is of practical use for farmers and the rural services sector. The Plant Industries NT Newsletter will have quarterly hardcopy and monthly e-newsletter issues. Therefore, if you want to receive the e-newsletter please submit your email address to me at Warren.Hunt@nt.gov.au.

In this issue we highlight a number of topics around growing healthy and productive snake beans, better understanding water use in vegetable crops, an update on pesticide permits, a bio-security segment on mango malformation disease and an update on African mahogany research and development. So please read on and enjoy this month's newsletter.

Regards,

Warren Hunt
Industry Development and Extension Leader
NT Dept of Resources.

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The PI NT is produced by the Plant Industries Group of Department of Resources.

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New Staff

*Warren Hunt,
Industry Development and Extension Leader, Darwin:*

Warren is a career extension professional having previously worked in the grazing industries of north Queensland with the former Queensland Department of Primary Industry (QDPI), coordinated integrated pest management efforts across the Australian sugar industry for BSES Limited, and more recently managed a state-wide extension program in the Tasmanian sheep industries with the University of Tasmania. He also began a PhD in 2010 investigating the role of extension in building capacity and resilience in Australian rural industries. His aim is to make difference through building industry and agency capacity.

Peter Stork – Horticulturalist, Katherine:



Peter has worked in the grains industries of western Victoria as a weeds agronomist and canola breeder. Peter made his debut into research horticulture in 1996 in the northern Victoria with research into temperate fruits. He obtained a PhD in Soil Science from the University of Melbourne in 2001 for his research into the impact of different herbicides in soil. Peter undertook post-doctorate studies at the University of Florida where he investigated nutrient uptake mechanisms in vegetable crops. On returning to Australia Peter studied education at Monash University and then worked with QDPI in Bundaberg leading research projects in the vegetable, macadamia and sugarcane industries. In 2008, Peter left for rural Vietnam to work as trainer in an AusAID capacity-building project. Peter will be dedicating his time towards research and development activities for the mango industry within the Katherine region.

*Cameron McConchie
Research and Development Leader*



Dr Cameron McConchie is a graduate of Melbourne University where he specialised in plant reproductive biology and physiology. He has worked in tropical horticulture with CSIRO for over 20 years focusing on perennial tree crops including lychee, mango, citrus and most recently macadamia. This industry funded research includes plant propagation, control of flowering and fruit set, a range of on-farm production issues, including synchronising harvesting through to consumer preference testing and value adding. He established the national macadamia improvement and conservation program that selected a range of candidate cultivars predicted to increase industry profitability by 30% after second stage evaluation.

Growing Healthy Snake Beans

By Barry Conde, Plant Pathology, Berrimah.

Water-logging:

Water-logging can cause an early death of snake beans in Darwin. If the soil is not ripped deeply enough, an impervious hard layer can develop resulting in poor drainage and water-logging. Roots become damaged in the anaerobic (low oxygen) conditions and are invaded by the water-loving fungus, *Pythium myriotylum*. To avoid water logging, make sure that deep ripping is a part of soil preparation when growing snake beans. Growing of a bulky green manure crop such as Sudax sorghum over the wet season and incorporation of this into the soil by ploughing improves the soil structure and can facilitate improved drainage.



A snake bean plant that has died as a result of *Pythium* infection following water-logging

Lack of basal fertiliser:

NT soils can be notoriously deficient in macro and micro soil nutrients. Prior to planting get your soil tested by your local agronomist. Beans belong to the legume family and are capable of developing nodules on their roots which have the ability to fix nitrogen from the air and supply it to the plant. The nitrogen available to the plant in this way is limited and additional requirements need to be supplied in the form of a complete NPK + trace mix. Apply a complex fertiliser such as yara mila complex, nitrophoska blue special or rustica along the rows at the rate of 70 g/m². The fertiliser can be placed in a band, 50 mm from where the seed is to be sown and covered with a layer of soil

(when banding fertiliser apply 15-20 g/m of row). Snake beans can be supplied for a considerable period and will

benefit from an alternating weekly schedule of fertigating with potassium sulphate and potassium nitrate at the rate of 5 g/m of row.

Root Knot Nematodes:

Another cause of early death in snake beans in Darwin has been root knot nematodes, *Meloidogyne incognita* and *M. javanica*. This is especially the case in the popular Green Pod Koahsiung variety. Snake beans in common with other legumes have nitrogen fixing (*Rhizobium*) nodules on their roots that fix nitrogen from the air into a form that is used by plants. The nitrogen fixing nodules are small, a millimetre to several millimetres in diameter. Root knot nematode infestation initially appears as small galls but grow larger so that the roots become distorted with large and often irregularly shaped lesions. The nematodes impede the action of the rhizobia starving the plant of nitrogen and causing leaves on affected plants to turn yellow, drop off, inflicting early plant death. Soil improvement by growing and incorporating a dense green manure crop of Sudax sorghum into the soil over the wet season has the added benefit of controlling the root knot nematodes in the succeeding crops. It is the breakdown of crop organic matter by soil microflora that causes a decrease nematode populations.

Fusarium Wilt:

Fusarium wilt also causes early death of snake bean plants. This has been seen in the Darwin snake bean growing areas since 1999. This wilt is caused by the fungus *Fusarium oxysporum* f.sp. *tracheiphilum* (E. F. Smith Snyder and Hansen). Plants affected by Fusarium wilt appear similar to those affected by root knot in that leaves turn yellow and fall off followed thereafter by plant death. The onset of visible symptoms are more sudden than infection by root knot nematodes. The distinguishing feature of Fusarium wilt on snake beans is that the internal water conducting tissues of affected plants begin to degrade and turn dark brown in colour. Once a field is infected with Fusarium wilt the resting spores or *chlamydospores* of the fungus ensure that the soil remains infective for more than 20 years. There are no chemicals or cultural controls for Fusarium wilt. The Plant Pathology Branch screened 74 varieties of snake beans and six varieties of cowpeas in glasshouse infection tests.



Snake bean plants killed by *Fusarium* wilt

No suitable cultivar resistant to Fusarium wilt was found for growing on infected farms. The Iron variety of cowpea has been shown to have excellent resistance to Fusarium wilt, as well to root knot nematode. It also possesses a strong root system and so was chosen as the rootstock for grafting snake beans as a management system for controlling Fusarium wilt. For further information on controlling Fusarium wilt, see Agnote 161 "Grafting Snake Beans to Control Fusarium Wilt" [Url: www.nt.gov.au/d/Content/File/p/Plant_Pest/807.pdf](http://www.nt.gov.au/d/Content/File/p/Plant_Pest/807.pdf)

Aerially borne diseases:

Above ground three diseases are recorded as problems of snake beans in the Darwin area. These are powdery mildew, Cercospora leaf spot and rust.

Powdery mildew caused by the fungus, *Podosphaera xanthii* is common in the dry season. It produces white powdery growth on leaves, petioles, young stems and sometimes pods. Microscopically, growth is often observed to be concentrated at the veins which often show as a reddish discoloration.

Cercospora leaf spot caused by the fungus, *Pseudocercospora cruenta*, causes large reddish brown leaf spots which are covered with dark sporulation in moist weather.

Rust, caused by the fungus, *Uromyces vignae*, has only rarely been recorded from snake beans in the Top End.



Cercospora leaf spot from below showing dark sporulation

Fungicides registered by the APVMA for these three aerial diseases of snake beans can be searched at the APVMA website at:

<http://services.apvma.gov.au/PubcrisWebClient/welcome.do>

Using keywords of "bean" and the name of the disease you are seeking information about.

Vege Notes - Five Basic Ways to Boost Your Irrigation Efficiency

Stuart Smith, Research Officer, Berrimah.

As the Top End moves into the dry season, irrigation becomes critical to yield and quality. It is also an expensive operation, as most growers water their crops between one and three times per day. With multiple blocks, this may mean running the pump constantly through the dry season. Growers routinely use soluble fertilisers in irrigation water as

well, which makes placement of water in the root zone crucial to both water relations and plant nutrition.

There are five tasks that must be done to optimise irrigation efficiency:

1. Know the soil

There is huge variation in soil characteristics between vegetable and melon farms in the Top End. Some soils are deep and uniform, with no hard layers to limit root growth, while others are shallow with distinct hard pans, or even rock just under the surface. Vegetables should be watered only to the depth that the roots can use. If a vegetable crop can only send roots to a depth of 20 cm because of the presence of an underlying hard pan, water should only be applied to moisten this depth. Therefore digging a hole with a spade or auger, and studying the soil drainage potential in each paddock is beneficial in making your irrigation strategies work.

2. Know the roots

Growers spend thousands of dollars on soluble fertilisers every year. This is a good way to grow crops in Top End soils, as the base level of nutrition in these soils is very low, and using soluble fertiliser allows good control of nutrition at critical growth stages. There are some growers, however, who fertigate, and unknowingly wash the nutrients deeper than the roots within the soil profile. This practice wastes fertiliser and potentially creates an environmental hazard in underground aquifers. To fine tune fertiliser use and apply water in the right place, rooting depths need to be better understood. Rooting depth can be affected by soil structure, depth, presence or absence of hardpans, and crop or variety type and age.



Digging a hole with an auger and layering the soil out on the ground is a good way to get to know the soil and the distribution of plant roots with depth.

3. Know the infiltration time from the surface to the roots

Even if effective rooting depth is known, some more information on infiltration rate is needed before irrigation can be confidently applied. There are some very practical methods in understanding infiltration rates. One is simply digging a hole along the drip or sprinkler line and observing the timed wetting front as it moves through the profile. Alternatively CSIRO have developed an instrument called a Full Stop® which can be quickly buried in the soil, and will indicate (by a coloured stalk popping up at the top) when water reaches a specified depth. Full Stops® can be placed at multiple depths so the time when water reaches different depths under the soil can be easily seen from the surface.

Full stop® equipment installed (vertical in soil) and exposed laying on the soil surface. The red funnel collects water as it infiltrates through soil, which causes a yellow or red marker to pop up at the end of the black tube. Soil water samples can be collected from the green hose.



4. Know how quickly the soil dries between watering

Most growers in the Top End irrigate their vegetable crops daily, or more than once a day, which is sensible under high evaporative conditions and soil moisture retention is low. However, to fine tune irrigation practice, the time it takes for soil to dry out to the point where a crop begins to feel stress needs to be known. Once known, irrigation can be scheduled before plants are stressed but not when the soil is still wet. In cool conditions, this period between waterings might be up to a few days while when it is hot and dry it might be only a few hours. Water use will also increase when plants are large and growing.

There are many ways to gather this information. Tensiometers are a relatively cheap and easy option and give a measure of soil moisture (called soil tension), and can be placed at a number of depths to ascertain water demand within the root zone. They need to be read on a daily basis (or even more than once a day) until the drying characteristics of the soil are determined. The numbers on tensiometers are also fairly easy to interpret – starting at zero kilopascals (when the soil is saturated) and rising as plants draw water from the soil. There are a range of soil types in the Darwin region, some may require farmers to commence irrigation at as low as 5 kpa whilst others with improved water holding capacity may indicate that irrigation would be required at 35 kpa.



Tensiometers installed at 20 cm (long tube) and 40 cm (short tube) in an okra crop grown under plastic

Other equipment can be used to measure soil moisture, such as gypsum blocks and capacitance probes. These are more expensive, but sometimes have automatic data-loggers which makes data collection easier. A method should be used that the operator is comfortable with and will give useful information on how soil moisture is changing with time.



An electronic meter is used with tensiometers to measure soil water tension.

5. Know the critical times for plant water need

This final tip may be the most important of all. During growth from seedling to maturity, different crops have different water needs depending on their stage of growth. For most crops that produce some sort of fruit, like beans, okra and melons, flowering and fruiting are times when there is a high demand for water. If taking soil moisture readings, this might show itself by the soil drying out more quickly during these growth stages than others. This is not a time to be caught short with watering; irrigation needs to keep pace with crop needs. There has to be capacity to water crops adequately during “money” stages, when they are producing a saleable product. Making mistakes at these critical stages could be the difference between an economic profit or loss.

Australian Pesticides and Veterinary Medicines Authority Minor Use Program

Melissa Fraser – Katherine Research Station

Australian law requires that all agricultural and veterinary chemical products sold in Australia be registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA). In most states, registered products must only be used for purposes that are specified on the label. In practice, situations often arise where chemicals are needed for a use not specified on the label; these are often termed ‘off-label’ uses. One of the current difficulties in horticulture is the lack of registered products for use specifically on minor crops. In general, minor crops are those where the costs involved in generating data for registration (residues, efficacy, environmental and worker safety data) are not recouped from the market. This can therefore result in a disincentive for the manufacturer, resulting in an impediment to growers who require access to alternative products. The lack of access to alternative chemicals is partly alleviated by dealing with minor uses as off-label permits, which are issued for a finite period.

The authority can consider applications for permits that allow for the legal use of chemicals in ways different to the uses set out on the product label. Off-label permit approvals are generally restricted to products which are already registered and for which the toxicological and environmental data packages have been assessed. One of the major objectives of the Minor Use Program is to consider ways of assisting in the development of residue data to support minor use applications.

Listed below are some of the current Minor Use Permits specific to NT crops. Full details of the permits and a permit



search facility are available on the APVMA website:
<http://www.apvma.gov.au/permits/search.php>

NOTE: Before using any product for an off-label use you must first obtain a copy of the permit for conditions of use and to ensure that the permit will cover the required use.

PER12389 - Methyl Bromide/Fruit and vegetables - post harvest fumigation/Fruit fly, whiteflies, thrips.
Valid 1-Sep-10 to 31-Aug-15.

PER12385 - Products containing Copper/Various Vegetable Crops/Various Diseases.
Valid 04-Feb-11 to 31-Mar-13.

PER9669 - Iprodione/Brassica Leafy Vegetables/Sclerotinia, Grey Mould, Alternaria Leaf Spot.
Valid 30-Jun-07 to 30-Jun-12.

PER9778 - Ecocarb Fungicide/Various Greenhouse-grown Vegetables/Powdery Mildew.
Valid 06-Sep-07 to 05-Sep-12.

PER11952 - Amistar 250SC (azoxystrobin)/Broccoli, Brussels sprouts, Cauliflower, Lettuce & Beans/Various fungal diseases.
Valid 01-Apr-10 to 30-Sep-11.

PER12157 - Dynasty PD Fungicide/Peanuts/Aspergillus crown rot.
Valid 15-Jul-10 to 31-Jul-12.

PER10679 - Mancozeb/Specified fruiting and legume vegetables/Downy Mildew, Anthracnose (*Colletotrichum* spp) and Alternaria.
Valid 10-Jun-10 to 01-Jan-12.

PER12445 - Fipronil or alpha-cypermethrin/Nursery stock (non-food)/Australian plague locust.
Valid 07-Jan-11 to 31-Aug-11.

PER11971 - Pegasus insecticide/Nursery stock (non-food)/Aphids, mites and whitefly.
Valid 12-Aug-10 to 31-May-15.

PER12785 - Deltamethrin and Iprodione/Cut flowers for export / Quarantine pests and diseases.
Valid 07-Apr-11 to 30-Jun-16.

PER6791 - Termidor (fipronil)/Ornamental & Amenity Trees/Giant Termite.
Valid 28-Nov-03 to 30-Nov-13.

PER12120 - Scholar (fludioxonil)/Mangoes (post-harvest)/Anthracnose, Stem end rot and Dendritic spot.
Valid 26-Jul-10 to 30-Jun-13.

PER12637 - Actara Insecticide (thiamethoxam)/Mangoes/Mango Seed weevil.
Valid 11-May-11 to 31-Dec-11.

PER9600 - Fipronil/Mango trees/Giant termite.
Valid 31-Jul-07 to 01-Jun-12.

PER12428 - Fipronil/Aggregation drum and sacrificial trees/*Mastotermes darwiniensis*.
Valid 12-Nov-10 to 30-Nov-15.

More information on the APVMA's Minor Use Program can be found at:

<http://www.apvma.gov.au/>

References:

http://www.apvma.gov.au/residues/docs/residues_and_minor_crops_info.pdf

Mango Malformation Disease

Plant Pathology Group.

Mango Malformation Disease (MMD) is a fungal disease of mangoes caused by several species of *Fusarium*, including some yet to be described. Mango is the only known host of the disease. The disease has been found in most mango growing countries of the world. Australia was thought to be free of the disease but in November 2007, symptoms of malformation disease were detected on 10 mango trees in a research trial containing about 2,000 trees at Coastal Plains Research Farm (CPRF) at Middle Point, about 60 km east of Darwin. The station was quarantined and locked down to prevent any spread of the disease. Extensive surveys on neighbouring commercial properties did not detect any trees with MMD symptoms. All mango trees at the Coastal Plains farm have now been removed and burnt.

The disease spreads on a tree very slowly, but if left unchecked, can severely reduce yields. The main method of spreading malformation disease to new areas is through infected vegetative planting material. There is no evidence that the disease can be spread on budwood, fruit, and packing bins. It is also usually associated with the bud mite, *Aceria mangiferae*, however, the mites have been shown to spread the disease within a tree and not between trees.

Symptoms:

At Coastal Plains Research Farm, trees with the disease developed galls in the leaf axils of flush tissue that had been produced at least six months earlier. The galls were roughly circular, 20–50 mm in diameter and consisted of a proliferation of shoots which grew to a length of 10–30 mm before dying and promoting the growth of new shoots. No galls or other malformations were seen at the terminals of branches. Symptoms were seen on trees from three to more than 12 years old. As in most overseas situations, some malformation of floral tissue was seen on two of the trees.

Over the past 25 years, somewhat similar malformation caused by bud mites has been occasionally observed in the Top End region. These are generally on poorly maintained older trees and are found on the terminals of the branches. They are much more irregular in shape, have high numbers of bud mites and no floral malformation has been observed. Whilst a *Fusarium* fungus had been extracted from the MMD galls at Coastal Plains, none as yet has been isolated from the bud mite malformations.



It is thought the MMD symptoms are a result of a hormonal imbalance in the trees which are induced by the *Fusarium* infections.

What you can do to assist?

If commercial growers or owners of backyard mango trees think that they have symptoms on their trees like those shown here, we would like them to contact the Department of Resources Plant Industries. We can then visit to inspect the suspect symptoms and take samples to detect bud mites and/or *Fusarium* in the tissues.

Please contact 08 8999 2344 or 1800 084 881 if you detect any mango trees exhibiting these symptoms.



African Mahogany - Tree Improvement Program

By Don Reilly, Forester, Berrimah Research Farm

Selection of superior African mahogany trees for conservation and breeding in Australia began ten years ago in a small area of old stands in the Territory at Gunn Point where a number of provenance trials were established in the early 1970s. The initial efforts were aimed to conserve the great variety of genetic material re-discovered in these provenance trials, ie 24 provenances from 11 countries of nativity.

Two clonal (grafted) seed orchards were established in 2001 by the NT Government and a provenance seedling seed orchard was established in Qld in 2003. These facilities only commenced fairly wide-scale flowering in 2007 and will take a few more years to produce sufficient seed to strongly impact on new commercial plantings -- initially, most likely, via 'family forestry' (in this case, by deployment of best-bet families as rooted cuttings that multiply seedlings from seed of the highest-ranked parents) and pilot-scale clonal forestry.

A second generation/progeny test was established at Katherine Research Station in the 2009-10 wet season from seed collected from the Howard Springs facility. Another similar facility with seed from Howard Springs, seed from a collaborator in Burkina Faso as well as seed from Sudan

supplied by commercial partners, African Mahogany Australia, has been established on its Gypsy Springs property in the Douglas /Daly region. For the first time this will allow viable comparisons of Australian seed-orchard seed with seed collected recently from African countries. These large provenance/progeny trials will serve to indicate the best sources of seed for commercial plantings and the potentially best trees from which to source genetic material for further propagation. Mass vegetative propagation is looking more likely with the work being undertaken through the Smart Forest Alliance Project – Queensland.

In combination with the seed orchards, a vegetative propagation program was undertaken in 2004/05, initially with seed from 11 of the original selects and north Queensland infusions to establish a hedge garden from which hundreds of cuttings can be obtained each year for deployment of rooted cuttings in clone tests, now numbering more than 10. One of these was established at Katherine in 2006.

Though early results of Series 1 clone tests planted annually since 2005 are already being used to short list partially tested clones for pilot-scale deployment, the genetic base and likely merit of the source materials are relatively narrow and modest respectively, so expected gains are modest.

Conversion of any clone test to a clonal seed orchard is undesirable. The mass cloning of some known highly superior phenotypes of 'selection age' and beyond (considered to be at least 5-6 years and above), awaits the development of suitable technology. Few if any existing stands of seed bearing age (around 8-10 years) seem suitable or available for conversion to seed production areas. Any seed production areas that might be established 'immediately' in large-scale plantings dating from 2005 – that may be available and with suitable breadth of genetic bases – would not produce commercial quantities of slightly-improved seed until around 2015.

Useful Links

APVMA – Public Chemical Registration System
<http://services.apvma.gov.au/PubcrisWebClient/welcome.do>

APVMA Permits
<http://www.apvma.gov.au/permits/search.php>

Horticulture Publications – DAFWA
http://www.agric.wa.gov.au/PC_91713.html?s=505199810

Mango Information Kit
<http://era.deedi.qld.gov.au/1647/>

NT Primary Industries Agnotes and Fact sheets
http://www.nt.gov.au/d/Primary_Industry/index.cfm?Header=Agnotes%20and%20Factsheets

Primary Industries Publications – NT DoR
<http://www.nt.gov.au/d/publications/>



Upcoming Events

Mangoes:

1. Workshop - Controlling termites in perennial horticultural crops – July (Darwin region). Exact date, time and venue to be advertised.
2. Formation of Mango industry small group networks (Darwin and Katherine), February 2012.
3. Annual mango pre & post-harvest disease management workshops. Darwin & Katherine – February - March 2012.
4. Annual 'Superior mango root-stocks' farm walks – April 2012.
5. Irrigation best-practice water use and nutrient efficiency workshops for NT mangoes. Darwin & Katherine, May – June 2012.

Fodder industry:

Fodder industry extension workshops

1. Market research findings
2. Production systems

Workshops at 4 x locations:

- Barkly
- Katherine
- Douglas-Daly
- Darwin

Dates to be advised in 2012

Asian vegetables:

Locations:

- Marrakai
- Humpty Doo
- Berry Springs

Topics:

1. Irrigation & water management. May-June 2011.
2. Post-harvest quality of respective vegetables – snake beans, okra, bitter melon and cucumber. July-August 2011.
3. IPM & disease management in vegetables - snake beans, okra, bitter melon and cucumber. September - October 2011.

Bananas:

On-farm workshop – Fusarium resistant variety selection for evaluation from overseas programs. November 2011.

Passion fruit:

Selection of superior rootstocks – farm walk at Berrimah Research Farm, followed by an industry development meeting with Passionfruit stakeholders. August 2011.

Papaya:

Industry developmental workshop. August 2011

