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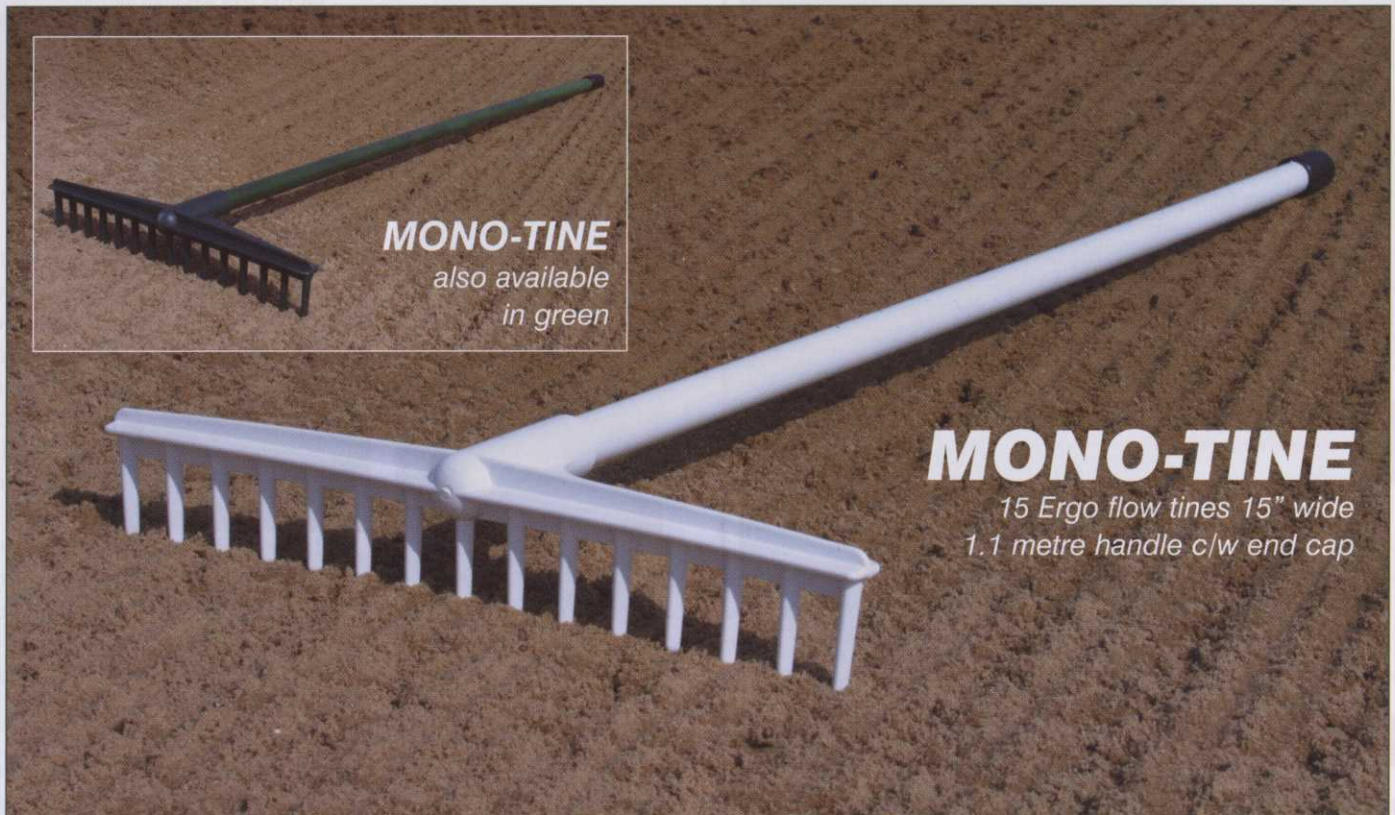


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Variety is the Spice of Life

While the use of fescue in Denmark has been making the headlines, Danish grass breeders have continued to develop other varieties which they feel have golf applications. Miranda Chambers reports on the work being carried out.

The main objective in the management of golf courses in Denmark is to achieve sustainability, where the management and use of golf courses relies on the conditions of nature. This means low input of fertilisers and irrigation with little or no use of pesticides. Sustainability has been defined by the R&A as: "Optimising the playing quality of the golf course in harmony with the conservation of its natural environment under economically sound and socially responsible management".



Comparison of three different red fescue types

In order to achieve "sustainability", grasses are managed according to which species are wanted on the green thus offering different options. These include a mixture of fine fescue or fine fescue and *agrostis capillaris*, or more recently *agrostis canina* (See recommended mixtures later). Fertiliser and mowing required would be 40-80kg N/ha/year and 4-6mm. Alternatively *agrostis stolonifera* as a straight would require 150 - 200kg N/ha/year and a mowing height of 3-4mm.

Fescue is the most sustainable grass used on Northern European golf courses and Denmark has featured heavily in its promotion. This style of management was recently debated during Harrogate Week 2006 where issues such as the relevance to this programme in the UK, the influence of existing and future legislation, budgetary constraints and environmental concerns were discussed. Chris Haspell, Course Manager, Horsholm GC in Denmark, spoke about the use of fescues in Denmark where 50% of clubs have introduced the grass.

In general the aim of management is to provide optimal growing conditions in order to avoid using products to repair damaged courses due to inferior practice. Restrictive irrigation and feeding is used to control the growth of *Poa annua*. Good quality, healthy greens are promoted as the main goal.

The aim of grasses on fairways should not be to be kept green all year round but to follow the natural variations over the year.

HOW ARE WE TO ACHIEVE THESE OBJECTIVES FOR SUSTAINABLE MANAGEMENT?

A great deal of focus is being placed on the breeding of main species; *Festuca rubra*, *Lolium perenne*, *Poa pratensis*, *Agrostis capillaris* and *Agrostis canina* as seen at DLF Trifolium's breeding station in Denmark

"We are concentrating on the following areas for all species: high turf quality all year around, high tiller density, therefore more competitive varieties than *Poa annua*, high resistance to most common diseases, like red thread and fusarium, and good colour, not yellow especially under low

input nitrogen regimes and persistency," explained turf breeders, Niels Christian Nielsen and Niels Roulund.

"Grasses should be able to survive many years. Wear resistance is important, particularly for perennial ryegrass," they added.

CHARACTERISTICS OF TURF SPECIES:

Perennial ryegrass (*Lolium perenne*): New generations of perennial ryegrass have very high tiller density with very fine leaves. They have started to be comparable to strong creeping red fescue but with much better wear resistance. They are easy to establish as well.

Strong creeping red fescue (*Festuca rubra rubra*): New, improved varieties have much higher tiller density and improved turf quality with finer leaves than older varieties. The stolons create a dense mat which can be instrumental in closing up damaged sod. The newest varieties have better resistance to red thread and winter fusarium.

Slender creeping red fescue (*Festuca rubra litoralis*): This species has a very high shoot density and excellent turf quality especially during summer months, where it has good growth even during dryer periods. High tiller density results in an increase in thatch production which has to be removed by verticutting to keep the turf in good growth and free from disease. Compared to chewings, slenders have a higher susceptibility to red thread and fusarium.

New slender creepers like Cezanne can tolerate mowing at a cutting height of 5-7 mm very well. Fescues on greens are generally much healthier than bent grasses and easier to maintain with less demand on verticutting and sanding.

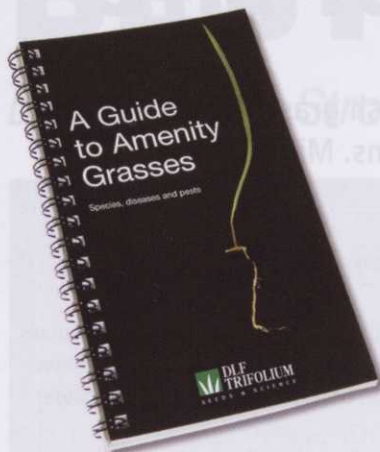
Chewings fescue (*Festuca rubra commutata*): This species has very good shoot density with the best turf quality during spring and autumn. Chewings fescue is less susceptible to disease than slender creepers and therefore more forgiving with a low management regime. The tolerance to low mowing is as good as slender creeping red fescue.

Chewings fescue is very well suited for mixtures with slender creeping red fescue for greens and fairways.

Smooth stalked meadow grass (*Poa pratensis*): Smooth stalked meadow grass is traditionally slow to establish but when established it produces a high quality turf. Wear tolerance is very good, making it suitable for use on fairways and tees. Smooth stalked meadow grass is able to spread underground with the aid of rhizomes and thus fill divots. It knits



Niels Roulund



Examining Microcover



"What strikes me is the weed free fairway and rough." Per Knudsen

together well so that whole plants are not easily removed in divots, therefore has good use on tees. Smooth stalked meadow grass tolerates mowing heights down to 13-40 mm very well. Some varieties are susceptible to *Dreosclera*. It is common to see yellow rust in late spring and autumn but the grass is not killed. Mildew may be seen during the same periods.

Browntop (*Agrostis capillaris tenuis*): Historically browntop has been the major component on greens due to its ability to tolerate low mowing. In Denmark it is normally used in an 85:15 mixture of red fescue and browntop.

SEED MIXTURES

Traditional mixture:

- 45% slender creeping red fescue
- 40% chewings fescue
- 15% browntop bent

Modern overseeding mixtures:

For overseeding purposes bent and fescue mixtures are best sown separately due to the dramatic difference in seed size.

Straight fescue mixtures are especially useful for early and late season renovation of greens tees and fairways because of the larger seed size. This mixture is best sown by direct drilling into the surface at a depth of 4-6mm.

J Fescue

- 25% Carioca chewings fescue
- 25% Musica chewings fescue
- 25% Barpearl slender creeping red fescue
- 25% Cezanne slender creeping red fescue

Straight bent mixtures can be used to renovate worn greens once soil temperatures have risen. They are best broadcasted onto the surface with a top dressing. This is true for traditional bent mixtures and the new cultivars of *Agrostis canina* like Villa which are best sown as a straight.

Greenmaster

- 75% Manor bent
- 25% Heriot bent

With proper management a very nice playing surface cut at around 5-6 mm, can be obtained. A level of management, including verticutting and topdressing is needed. Due to the milder winters *Fusarium* and other diseases occur from late October onwards until winter frosts commence. Input of nitrogen in Denmark is not as high as other countries.

Growth of fine fescue is kept at optimum level which prevents *Poa annua* appearing.

Creeping bents (*Agrostis stolonifera*): Some top level golf clubs are using creeping bents on their greens obtaining a lovely playing surface under a high management regime, which most clubs cannot afford. The turf quality is excellent but the Danish climate means that good greenkeeping is needed to address the weaknesses of creeping bent thatch buildup and the susceptibility to *Fusarium* in autumn and winter, which can be a very serious problem.

HOW DO WE SEE THE DEVELOPMENT OF GOLF COURSES CHANGING AND ARE WE ADAPTING OUR BREEDING TECHNIQUES ACCORDINGLY?

As the development of golf courses demand greater emphasis on sustainability, the use of species and breeding for abiotic stress tolerance (drought - cold), disease resistance and low input will become even more important. DLF Trifolium has already addressed the issue of low cutting management of fescues with cultivars like Cezanne slender creeping red & Musica chewings fescue, in order to use these species on greens instead of high input bent grasses especially creeping bent.

Development of microcover is an interesting concept and offers an alternative "green" nitrogen source which could be especially attractive on golf courses in semi rough areas.

"What strikes me is the weed free fairway and rough we have achieved after the microcover mixture has been established. We look forward to this continuing. A fresher, greener colour is visible with less input required. On the tees I have noticed the clover closes up the gaps quickly by the dense spread of stolons," said Per Knudsen, Greenkeeper, at Viborg GC.

By having turf trials in countries where conditions affect trials every year eg low temperature and snow cover in Poland and heat and drought in France, breeding can focus on testing for abiotic stress. The same applies for diseases where trials are performed in areas where these diseases are seen regularly e.g. crown rust in France, red thread in Denmark and the UK, *fusarium* in Poland and Denmark, brown patch and gray leaf spot in Maryland, Kentucky USA.

"Our programme has a major advantage compared to our competitors as we have a multi location testing facility and therefore tests for abiotic and biotic stress are more accurate," explains Niels Roulund.

"Since it is very difficult or impossible for one variety to be resistant to all possible diseases we hope, with the resources of genetic engineering, to obtain a general disease resistant strain which would save the environment a lot of fungicides - and ultimately gain permission to use this in the market place. In areas where insects are a problem we are working hard to identify specially effective strains of endophytes which are living in symbiosis with *Lolium* and *Festuca*."

'Miranda Chambers is UK Marketing Manager for DLF Trifolium Ltd. She can be contacted on 01386 793135. www.dlf.com / www.dlf.co.uk

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Protecting Our Sports

Richard Minton examines the need for good stewardship when it comes to chemical usage.

While chemicals remain a vital management tool in preparing sports surfaces, campaigners would like to see their total demise. Therefore, as an industry we must ensure that good product stewardship provides little, or no concern to fuel their argument.

Green campaigners could have a major impact on the preparation and protection of golf courses and sports fields throughout the UK, if they ever succeed in their aim to dramatically reduce, if not introduce a total ban of pesticide use. The National Association of Agricultural Contractors (NAAC), who are the trade association for all contractors, including the Amenity Sector, have been campaigning on behalf of the industry to ensure that a balanced argument into the benefits of pesticides are put before the government departments responsible for decision making with regard to future use.



While it is clearly understood that pesticide use should be a last resort, and that introduction of best cultural practices should minimise their use, they do have a role to play. The devastating effect of disease and weeds on playing surfaces would soon impact on the quality expected by those participating in sport today. Weeds especially, are very difficult to control, with no viable option to pesticide use - hand weeding would involve huge labour resources and costs.

For this reason, good product stewardship is essential, ensuring minimal environmental impact and giving the green campaigners negligible ammunition to support pesticide withdrawal. In agriculture, pesticide use is strictly governed by advisors & agronomists, and assurance schemes are in place governing application. In the amenity sector this is not always the case.

Even though the regulations are in place, pesticide application is poorly policed, often leading to misuse and possibly water contamination - the very ammunition looked for, to persuade the regulatory powers to introduce restrictions. Taking advice from BASIS qualified advisors, ensuring application is undertaken by fully qualified personnel, using the correct application equipment and with all the necessary legal and H&S documentation in place are the minimum requirements that anyone considering pesticide use should accept.

The NAAC can advise on contractors who fulfil the minimum requirements and they are also able to advise on the many schemes in place to ensure that, even if undertaking application in house, all legal and H&S requirements are met.

PLANNED WEED CONTROL

Amenity weed control is a high profile, very public operation, which is often carried out in sensitive areas such as in schools, on pavements, parks, urban green spaces, golf courses and sports pitches. It must

therefore be carried out to high professional standards, by qualified operators, protecting both the public and environment.

The client demands tidy, weed free public spaces, often within tightly controlled budgets. This can only be achieved if the contractor and the client work together to put in place a realistic and achievable weed control programme, to ensure that amenity contractors are able to provide a professional, efficient, safe and effective service.

Weed control programmes must be realistic and practical, with contractors being given greater notice if they are successful in an application, to allow proper planning and management. The contract term should also allow for the necessary investment in machinery and trained labour in order to bring together a planned, achievable weed control program, using only approved products.

Checks should be carried out by clients to ensure that operatives are meeting contract requirements, and likewise, contractors should carry out internal company audits, to ensure that employees are complying with company policy.

Within this framework, contractors must be kept properly informed and be given the flexibility within agreements to perform their operation responsibly, safely and in a timely way, for the most effective and environmentally responsible control of the weeds. This will provide both environmental and economic results to benefit clients, contractors, the community and the environment.

UNDERSTANDING PESTICIDES

A clear understanding of pesticides and their use will hopefully ensure that those using them will make the correct decisions, with regard to all aspects of application. 'Chemical' methods are defined as the use of pesticides to control weeds in amenity areas. 'Chemicals' may include natural and synthetic products.

A pesticide is defined (Food and Environment Protection Act (FEPA)) as any substance, preparation or organism prepared or used, among other uses, to protect plants or wood or other plant products from harmful organisms; to regulate the growth of plants; to give protection against harmful creatures; or to render such creatures harmless.

The term 'pesticide' therefore, has a very broad definition, which embraces herbicides, fungicides, insecticides, rodenticides, soil-sterilants, wood preservatives and surface biocides among others. Chemicals are applied via a knapsack, boom sprayer or via specifically designed application equipment.

'Chemical' methods suffer from an 'image' problem, in that the use of 'chemicals' tends to be viewed with some caution. However, the pesticides used in amenity areas are rigorously tested, to get Government approval for use, and, if used correctly by properly trained operators, this method should not present a high risk.

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Pesticides should only be used when necessary, and, if the benefits from using them outweigh any risks to the public and environment. When deciding whether to use a pesticide, a number of considerations are needed including: alternative means of control; possible harmful effects of the pesticide; the nature of the pest; the likely amount and cost of damage; previous experience of dealing with the problem; and the likely effectiveness of the pesticide.

If it is decided that a pesticide is the most appropriate method of weed control, then risk and COSHH assessments are required to ensure that the safety of the operator, public and environment are properly protected in all circumstances.

The major advantage of using chemical methods of weed removal is that, often, a much larger area can be effectively treated per day than with mechanical methods. Advances in application technology ensure accurate targeting of the problem weed or disease, and reductions in the amount of chemical used. In addition, chemical methods may offer longer lasting control of regeneration of weeds at least cost.

TOXICITY COMPARISONS

Comparing glyphosate, the most widely used herbicide, with a few everyday products. LD50 is the accepted scientific measure of acute toxicity to mammals, e.g. rat's dog's mice and humans. Acute LD50 is the one hit dose needed to kill half the members of a normal population. The figures given are for milligrams of the given active ingredient per kilogram of body weight of adult rats. It is accepted that this can be extrapolated up to the size of a human.

It is worth noting that it is the dose of anything that makes it a poison or toxic, not its inherent characteristics. Current regulations (COPR 1986), allow substances to be classed according to their potential hazard or toxicity using the LD50 measure.

- 0-5 mg/kg - extremely toxic
- 5-50 mg/kg - very toxic
- 50-500 - toxic
- 500+ - low toxicity
- 5000+ - not classified as toxic.

Product	Active ingredient	LD50* (mg/kg body weight)
Roundup	Glyphosate	6000+
Coffee	Caffeine	192
Anadin	Paracetamol	273
Aspirin	Aspirin	1000
Vitamin A	Vitamin A	2000
Shampoo	Selenium sulphide	138
	Zinc pyrithione	221
Pepper	Piperine oil	800
Vinegar	Ethanoic acid	3310
Salt	Sodium chloride	3000
Tobacco	Nicotine	53

- Coffee is approximately 30 times more toxic
- Paracetamol is approximately 22 times more toxic
- Vitamin A is approximately 3 times more toxic
- A certain shampoo is approximately 43 times more toxic
- Pepper is approximately 7.5 times more toxic
- Salt is approximately 2 times more toxic
- Nicotine is approximately 113 times more toxic



RISK FROM PESTICIDES USE

Operators handling and applying pesticides must comply with a wealth of legislation and be suitably trained. In addition, appropriate health and safety controls must be put in place. While historically, the amenity sector has had a voluntary industry Code of Practice for the Use of Pesticides in Amenity and Industrial Areas, (the 'Orange Code'), this is currently being integrated into the agricultural 'Green Code' by the Pesticides Safety Directorate and Health and Safety Executive, to form a mandatory revised Code of Practice for the Safe Use of Plant Protection Products. This is due to be published in early 2006. Whilst rigorous, such controls are an essential element of pesticides stewardship.

The mismanagement of weed control chemicals can lead to public safety concerns. It is therefore very important that all the necessary precautions are put in place, including meeting legal requirements, voluntary codes and label requirements, ensuring that the public and domestic pets are kept away from sprayed areas where necessary.

Water pollution can also be a serious issue if pesticides are not applied correctly. This can arise because many amenity chemicals are applied on hard-surfaces with 'run-off', and near drains.

The EC Drinking Water Directive sets a maximum level of 0.1 μ g/l for any individual pesticide and 0.5 μ g/l for the total level of pesticides in drinking water, irrespective of toxicity. The Environment Agency routinely monitors pesticide concentrations in surface waters and is able to monitor exceedances

CONCLUSION

Weed control and related services are vital to the management of golf courses, sports pitches, pavements and parks etc. which need to be undertaken following all of the very strict legal and H&S guidelines applicable today. Planned weed control programmes using approved products, applied by fully trained and certificated operators, will ensure good product stewardship, giving little or no concerns to those wishing to see the demise of all chemicals.

As has been illustrated, the majority of chemicals used in amenity today are far less toxic than many items in every day use and found in our kitchens or bathrooms and, if used correctly, present no danger to the public or the environment.

Richard Minton is Managing Director of Complete Weed Control and can be contacted 0800 7832884.

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