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International Herbage Seed Group

Newsletter

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IHSG

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IHSG WORKSHOP

The IHSG workshop was held in July this year and was a great success. It was attended by more than 60 delegates. It combined workshop sessions with visits to experimental sites, and seed growers. A full report of the meeting with some pictures of the evnt are included.
Following considerable discussion it was agreed to hold the 6th International Herbage Seed Conference in Northern Europe. For the first time it will be held in two counties. It will be held in Norway and Denmark from the 17-23 June 2007. Details of the programme, anticipated costs and contact details for all aspects of the organisation are included inside.
Details of the workshop and a full slide show of the area where it will be held can be found on the website.(http://cropandsoil.oregonstate.edu/ihsg/conference.html)

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Contents

President's Column

During the IHSG workshop in Winchester in July the presidency was passed from Bill Young to me, which I find both a great honour and a great challenge.

First of all I would like to extend my warmest thoughts to Bill and his wife Carol, and I'm sure, I can do this on behalf of the entire group. We are all aware of Bill's commitment to the IHSG, and during his presidency important improvements have been made. In 2002 our name changed from International Herbage Seed Production Research Group to International Herbage Seed Group. This was approved during the Perugia-conference –in part due to the efforts of Mario Falcinelli – as well as Bill Young! However, I found it a very useful change as I was never familiar with the abbreviation IHSPRG! In addition our logo was updated and in 2002 the website was opened and the newsletter became online. The website is hosted by Oregon State University and Bill has offered to stay in charge of the website. I think the website holds many opportunities with regards to information and communication.

I'm sure many of us have appreciated Bill's commitment to our well-being – as in Gatton, Australia 2003 and in Winchester, England, 2005 – either by making sure the organisation was smooth or by telling a joke! Bill: Your efforts and improvements are really appreciated, and we all wish you, Carol and your three grown-up 'children' more time to relax.

So who is the new president and what does she want to do? I've worked in seed production research since 1990, and took over the responsibilities from Anton Nordestgaard in 1991. Since then the government funding for research has decreased steadily, however, we've managed to increase our activities due to collaboration with the national seed industry. Some of the challenges we face are restrictions in the use of pesticides and nitrogen fertiliser. Lately I've been involved in strategy work on the co-existence between genetically modified, conventional and organic crops. This is an area where we may need to address more attention.

One of the future challenges to the IHSG is the decreasing support for research activities – it seems to be global! This means that fewer researchers are involved in the area, and it will become more and more difficult to attract young people to the area. In general this highlights the need for collaboration between countries and continents. I hope we can intensify our way of communication through the newsletter and on the website. A challenge that was already mentioned during the conference in Gatton was the need to focus more on warm-season crops and in general to have more collaboration between temperate and tropical areas.

This challenge has already been picked up by the organiser of the next ISHG conference, Trygve Aamlid, who in the preliminary programme has devoted a session to tropical crops / genetic diversity. Information about the 2007 conference is available on the website.

In 2005 more than 50 members of IHSG enjoyed a very successful workshop in Winchester. The workshop was very well organised thanks to Elaine Constable, Bill Welling, Alex Burgon and Athole Marshall. The workshop received considerable sponsorship and for the contribution of the sponsors I am very grateful. The programme was a good mix of short presentations, discussion and exchange of ideas and visits to farms. To James Hewetson-Brown, Angus Janaway and Dick Hall who allowed us to visit their farms and Justin Bidwell, who presented the TAG research, thank you very much. It really seemed that everyone enjoyed meeting new friends and catch up with 'the old ones'!

On behalf of the ISHG members I would like to thank Elaine, Bill, Alex and Athole for their efforts in organising a successful workshop.

Presentations from the workshop and tour highlights from the farm visits are available on our website 'workshops' (http://cropandsoil.oregonstate.edu/ihsg/workshop.html). I hope you will find some time to enjoy the presentations, and appreciate the efforts put into this way of sharing information.

With Christmas coming up very, very soon I'll end this, my first column, by wishing you all a Merry Christmas and a happy 2006!

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Sixth International Herbage Seed Conference

Norway and Denmark

17 - 23 June 2007

Dear Herbage Seed Colleague!

On behalf of the organizing committee it is a pleasure to welcome you to the 6th International Herbage Seed Conference in Norway and Denmark. With only 3-4000 ha harvested annually, Norway is a rather small seed producing nation. However, most of the acreage is concentrated in Vestfold county, which has a group of very experienced and enthusiastic growers producing seed of about 10 grass and clover species with timothy, meadow fescue and red clover as the main ones.

The venue for the conference, beautiful Gjennestad Horticultural College, is located in the midst of this county. After two days in this area, the delegates will have the chance to study about 30 seed production and turfgrass trials at Landvik Research Station before crossing the Skagerrak and continuing the post-conference tour in Denmark, by far the biggest seed producing nation in Europe.

As leader of the organizing committee. I will do my best to give you a memorable week in Scandinavia. However, the success of the conference depends on the delegates attending. Therefore I look very much forward to seeing YOU in Norway in June 2007 !

With my best regards

Trygve S. Aamlid

Preliminary conference prices†

	Delegate	Acc. person
Conference (incl. excursions)	470 •	300 •
Post conference	330 •	330 •
Total	800 •	630 •

*May be adjusted

Preliminary program

Sunday 17 June (afternoon)

- Arrival at Sandefjord airport Torp (direct connections to London, Amsterdam, Copenhagen)
- Shuttle buses and registration at Gjennestad College.
- Welcome party in the evening.

Monday 18 June

- 08.30 – 16.00

  Conference opening.

  Oral and poster sessions.

- 16.00 – 22:00: Visit to seed growers in Vestfold county (northern part): Timothy, meadow fescue, red clover, smooth bromegrass, colonial bent (organic growers included).

  BBQ in a farm garden (hosted by Norwegian Seed Growers Association).

Tuesday 19 June

- 08.00 – 17:00: Whole day devoted to oral and poster sessions. One session especially devoted to tropical crops / genetic diversity.
- 18:00: IHSG Business meeting.
- 20:00: Conference dinner.

Wednesday 20 June

- 08:00. Buses leave for NCRI Landvik Research Station

  (2.5 h drive). On tour we visit 2 seed growers in southern Vestfold (reed canarygrass, red fescue and perennial ryegrass).

- 13:00-19:00: Lunch + Field day in seed production and turfgrass trials at Landvik Research Station.
- 19.00-22:00: Excursion along Norwegian south coast onboard the sailing vessel ‘Solrik’. Meal on board.
- 22.00 Buses depart for Kristiansand (1 hour drive).
- 01.00: Night ferry departs for Hirtshals, Denmark.

Post Conference Tour

Thursday 21 June

- 08.00 Departure from Hirtshals. Guide: Christian Haldrup. Visit to seed growers on Jutland. Focus on perennial ryegrass and farming systems in general. During the visits farmers or advisers will inform about the implementation of the Danish environmental restrictions in agriculture.
- 18:00 Arrival to hotel

Friday 22 June

- 8:00 Departure from hotel. Visit seed growers fields on Funen and Sealand with focus on red and tall fescue. Visit a seed cleaning facility. Visit to the Danish Institute of Agricultural Sciences. Presentation of field trials in weed control, nitrogen application, row cultivation, post harvest treatments, interrow cultivation of green manure crops, Post Conference Tour

Saturday 23 June

- 9:00 Visit seed grower fields.

  Focus on cocksfoot, smooth stalked meadow grass, white clover, red and tall fescue.

- 15:00 Arrival in Copenhagen

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International Herbage Seed Workshop

The IHSG workshop was held in July, 2005 in Winchester, UK. Over 60 delegates from 16 countries attended the meeting. The organisers (Athole Marshall, Alex Burgon, Bill Welling and Elaine Constable) organised an excellent 2 day programme that combined workshop sessions on a number of key topics of current interest with plenty of opportunites for discussuion.

The mornings were devoted to presentations and discussion sessions with the afternoon to visiting trial sites of TAG, "The Arable Group",where some of the current research on aspects of forage seed production were demonstrated. There wera lso visits to some of the local herbage seed production farms. All of the participants were grateful for the seed growers for freely giving their time to talk about their forage seed crops, their general farming systems and the way that they were diversifying their businesses. These visits also provided an excellent opportunity for the delegates to learn, at first hand how some of the environmental legislation is impacting on seed production within the UK. Details of the presentations given by the invited speakers have been placed on the IHSG website (http://cropandsoil.oregonstate.edu/ihsg/workshop.html).

In addition to the organised scientific programme, several accompanied persons came to the workshop and were treated to an excellent programme organised by Carol Welling.

Details of the upcoming sixth conference can be found on page 3.

Visting the farm of Angus Janaway

Discussing the wild meadow at the farm of Angus Janaway

Dick Hall explains his cropping system to the group

Past presidents Mario Falcinelli (left) and Don Loch (right) with outgoing president William C. Young and incoming President Birte Boelt.

Immediate Past President Dr. WilliamC.Young III is presented with a plague in recognition of his contribution to the International herbage Seed Group by Incoming President Dr. Birte Boelt

Recent Publications

1. Use of lucerne for forage and seed production. (Grassland Science in Europe Volume 9).
Slepetys, J.

Land use systems in grassland dominated regions. Proceedings of the 20th General Meeting of the European Grassland Federation, Luzern, Switzerland, 21-24 June 2004. vdf Hochschulverlag AG an der ETH Zurich, Zurich, Switzerland: 2004. 445-447. 3 ref.

Six field experiments were conducted during 1998-2001 on a sod gleyic loam soil (Cambisol) in Lithuania with lucerne (Medicago sativa). A first crop of lucerne was cut for **forage** at weekly intervals from 30 April to 11 June. **Seed** was harvested from the first and second crops. Highest dry matter and digestible protein yields were obtained when the first crop of lucerne was cut at the latest date. **Seed** yields of the second crop were the lowest. It was found that, after cutting the first crop, there was a reduction in weed incidence, stem length, stem thickness and lodging in the second crop. During the first year of use, if the first crop was cut before bud initiation, **seed** yields of the second crop were identical with those of uncut lucerne. In the second and third years of use, **seed** yields increased significantly when cut at the same stage. If cut at the budding stage, the **seed** yields declined significantly. If 5 cm tops of the lucerne were cut in the third 10-day period of May before the start of budding, the **seed** yield increased significantly. But topping later, after the crop had lodged or after the first flowers had emerged reduced **seed** yields.

2. Breeding for disease resistance, forage, and seed production in Lotononis bainesii Baker.
Real, D.; Altier, N.

New Zealand Journal of Agricultural Research. Royal Society of New Zealand, Wellington, New Zealand: 2005. 48: 1, 93-100. 25 ref.

In 1999, INIA Uruguay initiated a plant breeding programme on Lotononis bainesii Baker, a subtropical **forage** legume from Southern Africa. **Seed**s from nine different geographical origins were grown and subsequently hand-crossed. Ninety crosses were generated and their variability was used to improve disease resistance, and **forage** and **seed** yield. Fusarium oxysporum, a fungal pathogen responsible for crown and stolon rot, is common in Uruguayan soils and the only public cultivar available is reported to be susceptible to this pathogen. In winter 2001, a **seed**ling screening method was used that allowed **seed**s to grow in Petri plates in the presence of the fungus. The resistant plants of each of the 90 crosses were transplanted into trays in a naturally lit glasshouse and subsequently divided into three sets with equal representation. Two of them were transplanted as spaced plant nurseries into each of two sites with distinct soil types in the basaltic region of Uruguay. The third set was transplanted into 10-litre pots to select for **seed production**. The best 17 crosses were selected based on their performance in **forage** and **seed** yield evaluations. In this paper we present the breeding methodology used in developing the cultivar 'INIA Glencoe' with improved disease resistance and improved **forage** and **seed production**. Preliminary tests conducted in 2003 to compare the new cultivar ('INIA Glencoe') with the public one ('Miles') demonstrated that 'INIA Glencoe' has superior disease resistance as well as enhanced **forage** and **seed** yield.

3. Response of lablab varieties to farmyard manure in the northern Guinea Savanna of Nigeria.
Amodu, J. T.; Adeyinka, I. A.; Lakpini, C. A. M.
Tropical Grasslands. Tropical Grassland Society of Australia, Inc, St Lucia, Australia: 2004. 38: 3, 186-191. 17 ref.

In 2000 and 2001, a field trial at Shika, northern Nigeria investigated the effect of farm yard (poultry) manure (0, 15, 20, 25, 30 and 35 t/ha) on the performance of lablab (Lablab purpureus) cultivars Rongai White, Rongai Brown and Highworth Black. Both **forage** and **seed** yields were significantly affected ($P<0.05$) by cultivar. The highest mean fodder yield (4.9 t/ha) and **seed** yield (0.98 t/ha) were produced by Rongai Brown and Rongai White, respectively. Highworth Black flowered and matured earlier than the Rongai cultivars. Cultivars Rongai Brown and Rongai White were the most promising for **forage** and **seed production** in the northern Guinea Savanna of Nigeria. **Forage** and **seed** yields increased linearly with increase in manure rates (mean **forage** yield at 35 t/ha FYM = 5.3 t/ha).

4. Influence of cutting management, irrigation schedules and foliar spray of growth hormones/micronutrients on forage and seed production of berseem (Trifolium alexandrinum L.).
Dinesh Kumar; Verma, O. P. S.
Annals of Agricultural Research. Indian Society of Agricultural Science, New Delhi, India: 2003. 24: 3, 634-638. 2 ref.

A field experiments was conducted for 3 consecutive years during rabi seasons (1995-96 to 1997-98) at the Central Research Farm of Indian Grassland and Fodder Research Institute, Jhansi, Uttar Pradesh, India, to study the influence of time of last fodder cut, irrigation scheduling and foliar spray of micronutrients/growth hormones for improved **seed** yield of berseem (Trifolium alexandrinum). The treatments consist of combinations of 3 cutting management: C1 - last fodder cut during last week of February; C2 - first week of March; and C3 - second week of March; 3 irrigation schedules: I1 - irrigation at last fodder cut and at flowering; I2 - irrigation after two weeks of last cut and at **seed** formation stage; and I3 - irrigation at 7 days after the last cut and at flowering; and 3 foliar sprays: E1 - 100 ppm gibberellic acid; E2 - 50 ppm kinetin; and E3 - 2.5 l tresol/ha. The highest **seed** yield was obtained from C2 being at par with C3 and both producing significantly

more **seed** over C1. At par **seed** yield was obtained in I3 and I1, both producing significantly higher **seed** over I2. Foliar spray of 2.5 l tresol/ha produced significantly more **seed** over the growth hormones.

5. Agronomic potential of Centrosema pubescens in well drained savannas of Anzoategui state, Venezuela

Rodriguez, I.; Flores, A.; Schultze-Kraft, R.

Zootecnia Tropical. Fondo Nacional de Investigaciones Agropecuarias (FONAIAP), Maracay, Venezuela: 2003. 21: 2, 197-217. 18 ref.

Centrosema pubescens is a widespread distributed **forage** legume in tropical America. It is considered intolerant to acid soils; however, some accessions or similar species like C. acutifolium can be tolerant. The purpose of this study was to evaluate both the adaptability and productivity of 23 accessions of C. pubescens to well drained savanna conditions, with acid and low natural fertility soils, of Venezuela. The experiment was conducted at the experimental station located in El Tigre, Anzoategui state. The accessions used in the experiment were collected in Brazil, Colombia, Panama, Dominican Republic, and Venezuela, obtaining the **seed**s from the International Center of Tropical Agriculture, CIAT, Colombia. A standardization cut was made 15 weeks after planting. **Forage** dry matter **production**, rooting capacity, and stolon length were evaluated every 12 weeks, during two years. A randomized complete block design was used, using 27 treatments (accessions) and three replications. Twenty three accessions of C. pubescens selected for good performance in an infertile acid soil were tested along with two control lines consisting on two accessions of C. pubescens and C. acutifolium. Means were compared using the Duncan test (P<0,05). Flowering onset and **seed production** were evaluated in an additional plot and the data were analysed using confidence interval. The results showed that two accessions of C. pubescens collected in Venezuela were outstanding among the others: CIAT 15160 for its high **forage** and **seed production** and CIAT 5169 for high **seed production** and rooting at the stolon nodes. It is highly recommended to do further studies with these accessions considering legume **production** and persistence under grazing when mixed with grasses.

6. Longevity of fodder galega grown for forage and seed on a low moor soil with a removed peat layer.

Slepetys,J.

Zemdirbyste, Mokslo Darbai. Lietuvos Zemdirbystes Institutas, Akademija, Lithuania: 2003. 84: 92-103. 20 ref.

Fodder galega (Galega orientalis) is a valuable **forage** legume. Compared with the other legumes, its cultivation has been insufficiently investigated so far. Very little research has been done into galega growing on drained low moor soil with a removed peat layer. The objective of the present study was to elucidate the effect of different galega management regimes on the productivity and persistence of galega stands. Experiments were conducted during 1998-2001 in the galega sward in Lithuania of the 5th-8th year of use. The following galega management regimes were used: 1. For **forage** annually; 2. For **seed** annually; 3. For **seed** every second year. In the last year of the experiment all treatments were cut for **forage** twice in order to follow the aftereffect. Management regime of the galega stand had a significant effect on persistence and botanical composition of the sward. Galega stands annually cut for **forage** thinned out in the eighth year of use. Its share in the dry matter declined to 22%. In the treatments where the **seed** was harvested annually, galega accounted for 78%, and in the treatments where the **seed** was harvested every second year galega accounted for 47%. In the last year of the experiment dry matter yield was 6.16; 8.00 and 7.02 t ha-1, respectively. A new phytocenosis with Poa palustris, Elytrigia repens [Elymus repens], Poa pratensis, Taraxacum officinale, Ranunculus lingua formed in place of the thinned out sward. Due to late frosts, that are quite frequent in low moor peat soil, the **seed** yield was low 32-179 kg ha-1. It can be concluded that in order to extend the age of galega stand on a low moor peat soil, it should be used both for **forage** and **seed production**.

7. Comparison of research-based forage seed production with farm-level in Northeast Syria.

Kugbei, S.; Niane, A.; Darwich, M.

Seed Info. WANA **Seed** Network, Aleppo, Syria: 2004. 26, 11-14. 5 ref.

The potential of **forage seed production** in developing countries is generally limited. Vetch (Vicia sativa) and barley (Hordeum vulgare) are important **forage** crops in Syria; lentil (Lens culinaris) straw is an important source of animal feed and is occasionally grown as fodder. In this study, costs and revenue data for vetch, barley and lentil drawn from farmers' fields in northeast Syria and from **seed** multiplication plots at the International Center for Agricultural Research in the Dry Areas (ICARDA) in Aleppo, are used to discuss opportunities for commercializing **forage seed production**. The results of this study demonstrate that high potential yield, appropriate harvesting methods and commercial use of straw are important factors, which determine profitability in cultivating vetch and lentil. Despite the low value of its straw, the cultivation of barley crop can be profitable in the rainfed areas, because the variable costs of **production** are low and no fertilizer is used. Under research conditions on the ICARDA farm, high yield potential combined with efficient mechanical harvesting of grain and straw render barley cultivation cost-effective. The case of barley demonstrates the important role that appropriate and efficient harvesting methods play in contributing to overall cost-effectiveness. That a potential exists for farmers to obtain high margins suggests that it is possible to promote cost-effective **seed production** at the local level.

8. Factors reducing yield of organic white clover seed production in Denmark.

Langer, V. & Rohde, B. (2005)
Grass & Forage Science **60** (2), 168-174.doi: 10.1111/j.1365-2494.2005.00465.x

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Factors reducing yield of organic white clover seed production were investigated in Denmark. In thirty-six fields from different regions, density of flower heads, and weevils of the genera *Apion* and *Hypera*, hatching from flower heads, were assessed. In fifteen of these fields, additional measurements were made in order to calculate potential yield and yield-reducing factors. Flower heads had a mean of ninety-two florets per head, of which proportionately 0·59 were intact, 0·08 were not pollinated and 0·34 damaged by weevils; 0·16 of the florets contained larvae of *Apion* species. In intact florets the mean number of seeds was 3·6. Density and size of flower heads were correlated with low density of flower heads leading to significantly more florets per head. The number of seeds per intact floret was correlated with the proportion of unpollinated florets. The number of insect-damaged florets was influenced by both larvae of *Apion* in and the numbers of *Hypera nigrirostris* (Fabr.) hatched from flower heads. One larva of *H. nigrirostris* caused approximately ten times the damage of a larva of *Apion*. Densities of *Apion* and *Hypera* were influenced by location, with fields with adjacent weevil sources being most at risk. An estimate of potential seed yield showed that, even under good harvest conditions, only a small part of potential seed yield is realized and that under suboptimal harvest conditions seed loss is high. The main factors responsible for low yields in Danish organic white clover seed production were identified as unfavourable harvest conditions and weevil damage.

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WHITE CLOVER AS A SOURCE OF NITROGEN FOR ORGANIC GRASS SEED CROPS

A.H. Marshall and H. McCalman

Abstract

The demand for organically produced forage seed is increasing rapidly as organic livestock farming expands. EU regulations stipulate that organically produced seed must be used in organic production systems though the quantities are not yet 100%. The production of forage seed in an organically acceptable manner to meet the current Seed Certification standards is a significant challenge to the seed producer. Conventional systems of grass seed production use inorganic nitrogen applied at specific stages of crop development and appropriate use of herbicides to produce high quality seed, reduce weed content and minimise seed cleaning costs. The effect of white clover, sown as a companion crop, as an organically acceptable method of supplying nitrogen, on the seed yield components, seed yield and quality of different grass seed crops is outlined. Current research on organic seed production of forage grasses at IGER is also described and methods of knowledge transfer deployed to integrate these research findings into commercial farm practice is discussed.

Introduction

Organic systems of forage production for feeding ruminants are based on a grass plus legume based sward with regular reseeding (Lampkin, 1990), placing a high demand on seed of appropriate varieties. At present the seed of forage species used by organic farmers is produced conventionally using inorganic fertiliser, herbicidesand fungicides to produce economic seed yields and maintain the seed quality and purity required by the UK Seed Certification Scheme (Burgon *et al*., 1997). It was intended that from the 1st January 2004, seed for use in organic production must be produced organically, however within the EU we are yet to meet this target. For forage seeds, organic production poses significant technical challenges both to the seed grower and the seed industry that must be overcome if organically produced forage seed of the appropriate varieties is to be available at a reasonable price and quantity for the organic sector (Marshall & Humphreys, 2002). High yield of quality seed depends upon good establishment, effective weed control, appropriate levels of crop nutrients, as well as efficient harvesting and seed cleaning. Research at IGER is focusing on several areas critical to the successful organic production of perennial, Italian and hybrid ryegrass seed within the UK. Conventional grass seed crops require mineral nitrogen at precise stages of crop development to stimulate flowering, ensure good seed filling and produce high seed yields. In organic systems, nitrogen can be supplied by application of animal manure or by using forage legumes to fix atmospheric nitrogen, either by relying on the residual N in the soil or by using forage legumes as companion crops (Aamlid, 1999). Little is known of the response of different grass species to such a system or the most appropriate companion legume for the different grass species. This paper describes an experiment to quantify the effect of a companion crop of white clover as a source of nitrogen on the seed yield and seed quality of different grass species.

Institute of Grassland and Environmental Research, Plas Gogerddan, Aberystwyth, Ceredigion, UK, SY23

Materials and methods

On 23 July 2001, 3 m x 1.4 m plots of the perennial ryegrass cv. AberDart, hybrid ryegrass cv. AberLinnett and Italian ryegrass cv. AberComo were sown at IGER, Aberystwyth on soil of the Rheidol series at a seed rate of 12kg/ha, 18 kg/ha and 18 kg/ha respectively in drills 20 cm apart. Plots were sown with white clover cv. AberAce (small leaved) or AberHerald (medium leaved) at 3 kg/ha in the same drill as the grass (T1), sown between the grass drills (T2) or between alternate grass drills (T3). Although not sown on certified organic land these plots were treated as though organic and received no fertiliser nitrogen or any chemical weed control. Control plots, sown in an adjacent block within the same experimental field, were treated as though a conventional seed crop and received fertiliser N and herbicide at a rate comparable with conventional treatments. On 19 October 2001 and 19 March 2002 the control plots received 62 kg/ha nitrogen as a compound fertiliser (21:8:11 NPK) and on xxx after the silage cut. The experiment was a randomised complete block with three replicates.

On 16 April, 2002, all hybrid ryegrass and Italian ryegrass plots were cut at a height of 3cm with a Haldrup forage plot harvester. Fresh herbage weight per plot was measured and a subsample of 100 g removed, dried at 80ºC for 8h in a preheated forced-draught drying oven and dry weight (DM) recorded. The dried sample was milled through a 1-mm sieve and % nitrogen (%N) measured according to the standard Kjeldhal method for total N. A 25cm x 25cm quadrat was also sampled from within the perennial ryegrass plots and %N determined as above.

Two weeks before harvest a 450cm^2 quadrat was removed from each plot. The number of reproductive tillers was counted, a subsample of ten tillers removed and the number of spikelets per tiller and seeds per spikelet counted. All plots were harvested with a Hege small plot combine, seed was dried in linen bags over cold air and treshed with a Seven L thresher. Seed weight per plot and mean seed weight was determined.

Results

Percent nitrogen content of the grass when grown with white clover ranged from 1.4% to 1.9% and in the conventional plots from 1.9% to 2.6 % (Data not shown).

The number of reproductive tillers of the grasses when grown with white clover was comparable with the control in most treatments (Figure 1a). Only Aberdart in T1 and AberLinnett in T2 and T3 had significantly fewer reproductive tillers than the control. In contrast the number of seeds per floret was significantly less than in the control plots in all of

the treatments, ranging from 55% to 80% of the controls (Figure 1b). They were lowest in AberDart, highest in AberLinnett and intermediate in AberComo. This was reflected in the harvested seed yields which were significantly lower in the treatments with the white clover companion than in the control plots. In T1, T2 and T3, AberDart had a significantly higher seed yield than AberLinnett and AberComo (Figure 1c) with the harvested seed yield in T2 nearly 80% of the control plots.

The difference in seed yields in the three treatments were relatively small however seed yields were greatest in T2, where white clover was sown between the drills of the grass seed crop. Weed content was relatively low in all of the treatments and there were few significant differences between the treatments or between the treatments and the control. There were differences in mean seed weight between the grasses grown with white clover and those receiving fertiliser nitrogen. Thousand seed weight of AberComo, AberDart and AberLinnett when grown with white clover was 1.85g, 1.68 g and 3.70 g respectively (mean of T1, T2 and T3) compared with 2.09 g, 1.83 g and 4.01 g when grown under a conventional fertiliser regime. Germination rate of the grass seed sown with the white clover was significantly lower than the controls (Table 1).

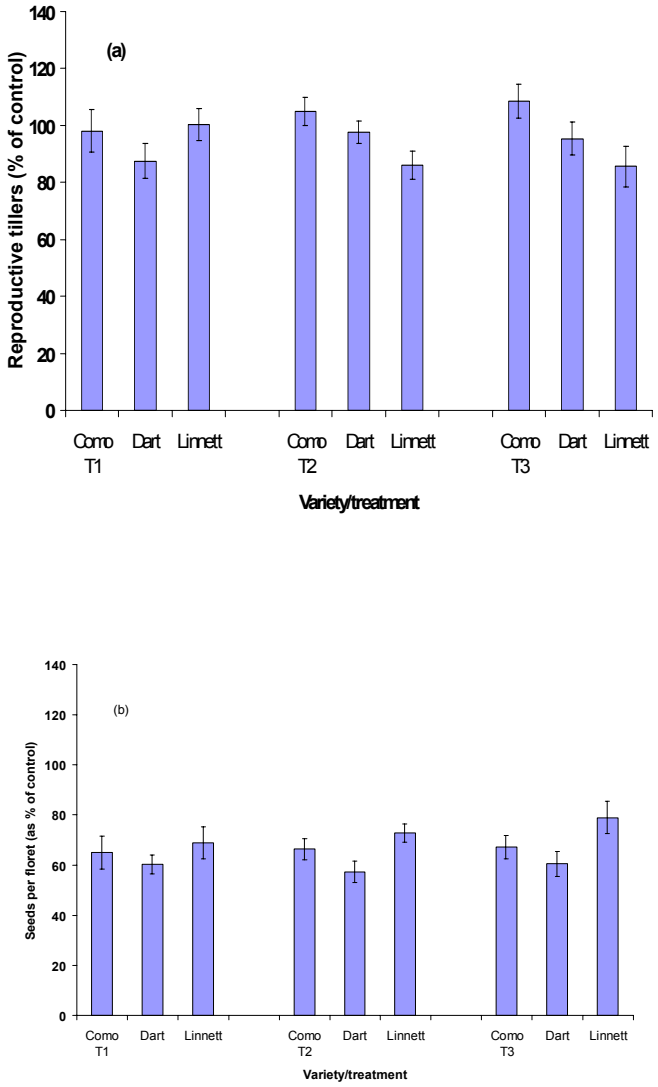

Figure 1 Number of reproductive tillers (a), seeds per floret (b) and harvested seed yield (c) of AberComo, AberDart and AberLinnett sown with white clover in the same drill (T1), between each grass drill (T2) or between alternate grass drills (T3). Data is presented as a % of the control plots receiving a conventional fertiliser regime. Vertical bars represent standard error.

Table 1. % germination of grass seed from plots sown with white clover (mean of T1, T2 and T3) and control plots receiving fertiliser nitrogen at 7, 10 and 14 days.

Treatments		7	10	14
Sown with clover	AberDart	66	75	77
	AberLinnet	54	62	63
	AberComo	66	74	74
Control	AberDart	78	84	84
	AberLinnett	78	86	86
	AberComo	65	77	80

Discussion

Providing sufficient nitrogen to the developing seed crop is a significant challenge for the organic grass seed producer. In this experiment we have investigated the potential of white clover as a companion crop for different grass species, to determine if white clover is sufficient to supply the amount of nitrogen necessary to produce resasonable seed yields. Generally the seed yields were low compared with the plots receiving a conventional seed crop management however no difference in heading date or in general crop development were observed between the plots sown with white clover and the controls. Nitrogen content of the grass foliage in early spring has been used as an indicator of the seed yield potential of perennial ryegrass (Rowarth & Archie, 1975). The nitrogen content of the grass foliage was lower in the plots sown with white clover than in the plots receiving conventional levels of fertiliser N. Interestingly, the number of reproductive tillers and spikelets per tiller (data not shown) of the grasses sown with white clover and those receiving fertiliser N was comparable. However there were fewer seeds per floret and a lower mean seed weight contributing to the lower harvested seed yield.

In the UK, conventional grass seed growers defoliate Italian and hybrid ryegrass in the spring prior to the seed harvest (Marshall & Hides, 1999). This removes excessive spring growth to avoid lodging that can result in poor pollination and seed set. On farms with livestock, the forage removed at defoliation is also used to make high quality silage. The low seed yield of AberComo and AberLinnett in comparison with the perennial ryegrass variety AberDart suggests that in this type of system, nitrogen levels may be insufficient for regrowth after the silage cut. Where a silage cut is taken then application of animal manure to may be required to supplement the nitrogen removed in the silage may necessary and the potential of this to improve seed yields will Be A part of future studies.

One of the objectives of this study was to determine the weed content of the plots and if white clover sown within or between the grass drills will suppress weeds. There was no significant difference between the treatments or clover variety in the weed content of the seed sample suggesting that the weed problem was no worse under this system. Weed content in the second harvest year will be monitored. Other studies are investigating the potential of other legume species both as companion legumes and as fertility building crops prior to sowing grass seed crops. This is being carried out both in small plots at IGER and on commercial organic farms as part of a large-scale demonstration project where organic farmers are adapting results from these small plot trials into their farming systems.

Acknowledgements

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Genetically Modified, Conventional and Organic crops
The Danish Strategy for Coexistence

Birte Boelt

INTRODUCTION

Co-existence is defined as the farmers being able to choose between conventional, organic and genetically modified (GM) crop production, in compliance with the relevant legislation on labelling rules and purity standards. Genes of cultivated plants spread in time and space through pollen and seed dispersal, and in addition handling during transport and processing may also disperse seeds.

Consequently, suitable measures during cultivation, harvest, transport, storage, and processing are necessary to ensure co-existence in the supply chain of propagated seed. With the increasing area of GM-crop production as well as in the number of crops in which GM-varieties are available the need for guidelines to ensure coexistence are becoming increasingly essential.

CONTROL MEASURES TO MINIMISE GENE FLOW

Coexistence in agricultural production systems and supply chains is not new. From the experience of internationally approved seed propagation schemes and studies on coexistence scenarios control measures are identified, that need to be adopted in crop production systems to ensure co-existence.

Pollen disperses in space – between fields, farms and regions. The identified control measures are

- Isolation distance, border row management
- Control of volunteers and hybrids
- Modelling and monitoring

Seed disperse over time – between fields, but also between farms and regions (propagated seed). The identified control measures are

- GM-free propagated seed
- Cropping intervals – control of volunteers, hybrids
- Cleaning of farm equipment, handling and storage facilities
- Adaptation of trace ability and labeling systems

The effect of the specific control measure will depend on the crop (breeding system), field size, farming structure, landscape, production area of the specific crop in the region etc. Therefore control measures should be crop, site and farm specific.

A STRATEGY FOR COEXISTENCE

In the spring of 2002, the Danish Minister for Food, Agriculture and Fisheries initiated strategy work on the cultivation of authorised GM crops in Danish agriculture. The aim was to produce a Danish model for the co-existence of GM, conventional and organic crops in support of the free choice of consumers and to ensure development possibilities for new and existing production forms. In order to provide the optimum basis for decisions, three working groups were set up, that were assigned the task of presenting the scientific and legal problems as well as drawing up a proposal for a Danish co-existence model. These groups were the expert group, the legal group and the contact group.

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The expert group was assigned the task of

- Conducting a scientific analysis of the sources of dispersal from GM to conventional and organic production forms
- Assessing the scope of dispersal as well as the need for control measures to be taken
- Identifying as well as assessing potential measures to secure the co-existence of GM, conventional and organic production forms.

After several meetings a draft report was presented to the contact group, where a broad range of stakeholders were represented. In January 2003 the report was presented in the Danish parliament, and in August 2003 the final report was published. The conclusion is, that for the majority of crops grown in Danish agriculture co-existence is possible, at the stipulated or presupposed threshold values, when the recommended control measures are applied, however, a few out-crossing crops and/or crops with long seed persistence in soil, the analysis group were not able to recommend control measures that may ensure co-existence.

THE ACT OF THE GROWING ETC. OF GENETICALLY MODIFIED CROPS

The Danish Parliament has adopted "Act on the Growing etc. of Genetically Modified Crops" Act No. 436 of 9 June 2004 (http://www.fvm.dk/fvm_uk). The Act applies to commercial growing, handling, sale and transport of genetically modified crops as far as the first buyer with a view to limiting the possibility of dispersal of pollen, seeds and vegetative propagation material to other fields and crops there from.

The Act states that the Minister for Food, Agriculture and Fisheries may lay down rules providing that the growing, handling and transport of genetically modified crops may only be performed by persons holding a license to prove that they fulfil certain education requirements within the field of coexistence between genetically modified, conventional and organic crops, and subject to previous authorisation.

The Minister for Food, Agriculture and Fisheries may lay down rules on the growing, handling and transport of genetically modified crops, including on

- The registration of anyone who handles or transports genetically modified material

- An obligation to notify owners and users of nearby fields, purchasers, partners etc. in connection with:
- Growing
- Use of vehicles, machines, equipment, and storage rooms etc.
- Transfer of the right to use or the ownership of fields, vehicles, machines, equipment, storage rooms etc.
- Reporting of fields with genetically modified crops.
- Growing, including also rules on the distance to other fields with the same crop etc. and on growing intervals
- Storage and transport
- Cleaning of vehicles, machines, equipment, storage rooms etc

The regulation is largely based on the co-existence report from the Danish expert group (Tolstrup et al., 2003), discussions with stakeholders in the contact group, presentations by international experts at hearings in the Danish Parliament and conclusions from the 1st European Conference on the Coexistence of Genetically Modified Crops with Conventional and organic Crops, GMCC-03 http://www.agrsci.dk/gmcc-03/ (Boelt, 2003).

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Conference News

XXVI meeting of the EUCARPIA Fodder Crops and Amenity Grasses Section and XVI meeting of the EUCARPIA Medicago spp Group

Dear Colleague,

On behalf of the Organising Committee it is my pleasure to invite you to the **XXVI meeting of the EUCARPIA Fodder Crops and Amenity Grasses Section** and **XVI meeting of the EUCARPIA Medicago spp Group**, that will be jointly held in Perugia, Italy, from 3 to 7 September 2006.

The general title is: "Breeding and seed production for conventional and organic agriculture".

Organic agriculture has become economically relevant in Europe and presents new challenges for breeders and seed producers of fodder crops and amenity grasses. One session will deal with topics in relation to organic farming.

We will discuss these and other issues through invited talks and offered talks and posters.

Technical visits to research and production sites will be organized.

Perugia can offer you a very pleasant stay. Artistic attractions, from Etruscan to Roman to Medieval to modern times, are abundant in the Perugia Area, in a unique and well preserved landscape dominated by olive orchards and vineyards.

We are planning to have an all-electronic communication and registration system, with no conventional mailings.

This web site www.eucarpia2006.net will give you all the necessary information. We invite you to bookmark and visit it periodically to stay updated about the meeting.

Conference News continued

Symposium on Plant-Pollinator Relationships-Diversity in Action

About every five years, the International Commission for Plant-Bee Relationships sponsors a Pollination Symposium, with the latest one held in Hungary in 2001. Recently, the Commission accepted a proposal to hold the next Symposium in Ames, Iowa in July of 2006.

The overarching theme of the Symposium will be "Plant-Pollinator Relationships – Diversity in Action." We have defined four sub-themes focusing on the following topics: attractions and rewards; impacts of insect-mediated pollination on gene flow; pollinator biology, conservation and protection; and pollinators in plant genetic resource conservation and enclosed production systems. If you would like more information about the Symposium, a website is now under development and can be accessed from http://www.ucs.iastate.edu/mnet/plantbee/home.html

The 13th Australasian Plant Breeding Conference is taking place in Christchurch, New Zealand from 18-21 April 2006.

The range of themes and crops covered in this conference is diverse, reflecting the breadth of research activity across Australasia. We will be highlighting the economic, sociological and environmental benefits of plant breeding in Australia, New Zealand and South-East Asia through our conference theme, "Breeding for Success: Diversity in Action".

I would like to encourage you to register your interest in attending the 13th APBC if you are involved in research or application of molecular or conventional genetics and plant breeding. The call for papers and registration brochure will be available in early March and full details will soon be available through the website on www.apbc.org.nz

Ensure you receive a brochure by registering your interest on-line.

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The Organizing Committee warmly welcomes you to participate in the 21st General Meeting of the European Grassland Federation, which, under the theme 'Sustainable Grassland Productivity', will be held at Badajoz (Spain), from 3rd to 6th April 2006.

The objective of the General Meeting is to present and discuss the existing information on different aspects of grassland management, which will provide grassland farmers a sound basis to develop sustainablesystems, whether socioeconomic, ecologic or environmental.

Participants are invited to submit abstracts, first, and full scripts,later, for oral or poster presentations under one of the following sessions:

1. Overcoming seasonal constraints to forage production.
2. Role and potential of legumes.
3. Production and quality aspects of different animal feeds.
4. Changes in animal production systems to meet CAP reforms.
5. Grassland and climate change.

All the papers will be peer reviewed. All the accepted papers will be published in the 11th issue of the EFG series 'Grassland Science in Europe'.

Two Pre-conference Tours are offered, starting in Madrid on 30th March and ending in Badajoz on Sunday 2nd April, covering 1) Central West Spain and 2) South West Spain.

An attractive Associate Delegate's Programme is also offered to visit the more relevant historic places of Extremadura, some of which are included in the UNESCO World Heritage List.

Transport by bus will be provided to travel from Madrid to Badajoz and
return. A list of Hotels in Madrid and Badajoz will be offered later.

Please visit regularly www.egf2006.com to find more detailed information on different aspects of the GM: sessions, programmes, deadlines, tours, instructions for abstracts, full papers and oral or poster presentations, transport, accommodation, etc..

Pre-registration: 16th May 2005 (Please use the registration form, which is in the web page) Title and abstract: 30th June 2005 Full length paper (3 pages): 15th September 2005 Definitive registration (early) and money transfer: 15th January 2006 Hotel reservation: 15th January 2006

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