WEED CONTROL IN *FRAXINUS EXCELSIOR*

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There is considerable interest among farmers in planting broadleaved trees like *Fraxinus excelsior* L. in lowland, relatively fertile soils, that were heretofore used for intensive grassland agriculture. The presence of grasses and weeds in tree plantations on such soils can influence establishment. Saplings of *Fraxinus excelsior* were planted on an imperfectly drained loam to clay loam at Johnstown Castle in April 1989. The sward was burned off with glyphosate 3 weeks before planting. There were 40 rows of 30 trees per row. Complete weed control was maintained for the first 20 trees in each row from 1989 to 1992. For the last 10 trees per row there was no weed control in any of the 4 years. While there was no replication in this experiment the soil throughout the experimental site was uniform and the results allow meaningful deductions to be made as to the effect of weed control on tree mortality and growth. In December of each year dead trees were counted and heights and diameters, at 30 cm above ground, were measured. At the end of 4 years' growth, in the absence of weed control, the trees had only 26% of the height and 34% of the diameter of the trees where weeds and grasses were controlled. Tree mortality for the non-weed-control and complete-weed-control regimes were 17% and 4%, respectively. Weeds and grasses prevented the rapid growth of trees. Tree quality was also adversely affected by the lack of weed control. It is suggested that competition for moisure, rather than for nutrients, was the main reason for the reduced growth rates.

SELECTION AND MICROPROPAGATION OF ELITE WILD CHERRY TREES

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The genetic quality of hardwood trees currently being planted is poor. Breeding of superior quality trees is slow, seed production is erratic and seeds of high genetic quality are very limited in supply. An alternative to seed is to use vegetative propagation and to propagate from trees which show superior morphological and phenological traits at maturity (elite trees). The performance of clones of elite lines should be better than that of unselected seed populations and clonal forestry, based on multiclonal plantations, is the most efficient method to increase the output of hardwood forests such as high value wild cherry (*Prunus avium*). In forest stands, elite trees of *Prunus avium* were identified for clonal propagation *in vitro*. Three sources of bud explants were used to determine the most efficient method for obtaining sterile, shoot-producing clusters. The sources were a) shoot suckers induced in root pieces (20 to 30 cm) which had been excavated from around elite trees and cultivated in peat:perlite (1:1), b) resting buds, collected from young trees in November, stored in a refrigerator and later dissected to remove the outer scales followed by excision of the shoot tip for *in vitro* culture, c) forced buds from twigs which had been collected from elite trees and forced into growth in a solution of 8-hydroxyquinoline (200 ppm) and shoot tips were excised from such forced shoots for *in vitro* culturing. Buds derived from induced root suckers showed the highest sterility (34%) followed by resting buds (26%) compared with 17% for buds collected from crowns and forced in water + hydroxyquinoline. Rates of viability and capacity to give shoot-producing cultures were 54% for root suckers from 4 out of 6 clones tested, 50% for resting buds from 4 out of 5 clones and only 11% for forced buds from 2 out of 5 clones.

PRODUCTION OF ARTIFICIAL SEEDS OF *DAUCUS CAROTA*

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Production of artificial seeds (somatic embryogenesis) was first observed in the 1950s and is a tissue multiplication process which can produce thousands of embryos, each with the potential to form a plant from a few grams of callus. The earliest somatic embroyogenesis work was conducted with carrot and this species is now widely used as a model for such work. In conjunction with similar work using sugar beet, it was decided to use carrot somatic embryos as the source material for the production of artificial seeds, so that a fuller understanding of the process of artificial seed production might be obtained and

used to advance our studies with sugar beet. The observed growth of embryos encapsulated in alginate beads supplemented with artificial endosperms and incubated on varying concentrations of solid nutrient medium showed that a nutrient source supplied in either the artificial endosperm or the incubation medium was adequate for embryo survival. The growth of both heart-stage and torpedo-stage embryos was inhibited by the inclusion of abscisic acid (ABA) in liquid medium at either 1 or 2×10^{-6}M. The removal of the ABA-supplemented medium allowed for the recovery of the embryos. The rate of recovery of heart-stage embryos was higher from the culture pre-treated with the stronger concentration of ABA. This was in contrast to the torpedo-stage embryos where higher percentages of growth were recorded from the 1×10^{-6}M ABA pre-treatment. Torpedo-stage embryos were subjected to 0, 1, 2 or 4 days of desiccation following various pre-treatments involving ABA and heat. Control embryos did not survive but the pre-treated embryos appeared to be tolerant of desiccation to varying degrees. Embryos subjected to heat pre-treatment survived 4 days of desiccation while embryos pre-treated with ABA alone or a combination of ABA and heat were only able to survive 1 and 2 days of desiccation.

IDENTIFICATION BY HIGH PRESSURE LIQUID CHROMATOGRAPHY OF BARLEY CULTIVARS GROWN IN IRELAND

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Electrophoresis is routinely used for varietal identification of cereal cultivars. However, it may be subject to technical problems and experimental variability and therefore high pressure liquid chromatography (HPLC) was investigated as an alternative for the identification of a range of spring barleys grown in Ireland. Hordeins from bulk flour (0.1 g) or seeds were extracted with 55% isopropanol containing 1% dithiothreitol (with 0.4 ml in the case of flour or 0.3 ml when using seeds) at 60°C for 30 min or 1 hour with periodic vortexing. A Waters HPLC system, equipped with ultraviolet and fluorescence detectors and Biorad Hi-Pore C4 (250× 4.6 mm), Vydac TP C4 (250×4.6 mm) and Vydac TP C4 (55×4.6 mm) reverse-phase columns, was used. Elution solvents A and B were 15 and 80% acetonitrile with 0.1% trifluoroacetic acid each, gradients of 25 to 46% B in 60 min, 25 to 48% in 30 min and 25 to 48% in 18 min were used for the first, second and third column, respectively, and injection volume was 15 μl in each case. Identification was based on elution profiles produced by the resolution of hordeins by reverse-phase HPLC which were well resolved, reproducible and significantly different for each cultivar in the present study. Analysis time, 60 min with the standard 20-cm column, could be reduced to 30 min by using a 5-cm column and a steeper elution gradient. The results indicate that reverse-phase HPLC is a valuable tool for the identification of spring-barley cultivars and the short analysis time offers considerable potential as a method for the determination of varietal purity as opposed to using gel electrophoresis.

THE GROWTH, YIELD AND QUALITY OF WINTER WHEAT AND WINTER OATS GROWN UNDER AN ORGANIC CONVERSION REGIME

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Nine wheat and six oat cultivars were sown in autumn 1991 on a site in its second year of conversion to full organic status. The preceding crops were phacelia and lucerne, respectively, grown as green manures. Two seeding rates of wheat (400 and 480 seeds/m^2) and three of oats (400, 480 and 560 seeds/m^2) were used. Plant establishment varied with the level of seed-borne Fusarium, particularly *F. nivale*. Weed levels were low and no control measures were necessary. Disease levels were also generally low. Yellow rust was the main disease present on the wheat but remained at levels less than 4% of leaf area per fertile tiller (NIAB Disease Assessment Manual). Powdery mildew was the main disease present on oats but the level was less than 10%, except on two cultivars in late June when it reached the 10 to 20% level. Varietal yields ranged from 5.6 to 9.4 t/ha for wheat and from 5.5 to 8.2 t/ha for oats. Specific weights of wheat ranged from 73 to 80 kg/hl and from 50 to 54.5 kg/hl for oats. The Hagberg falling number of wheat ranged from 127 to 334 but the protein content was very low (less than 9.5% in all cultivars). In oats, the yield response to increasing seeding rate varied with cultivar (increased in cv. Nuptiale, decreased in cv. Kynon, unaffected in the other cultivars). Increasing the seeding rate in wheat had no effect on either yield or yield components except in the case of a decrease in the number of grains/ear at the higher seeding rate leading to a higher specific weight.