

# **Annotated Bibliography on the Ecology and Management of Invasive Species:**

## **Orchardgrass (*Dactylis glomerata*)**

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and the Nature Conservancy of Canada**

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### **Austad-I {a}; Losvik-M-H, 1998**

Title: Changes in species composition following field and tree layer restoration and management in a wooded hay meadow.

Source: *Nordic-Journal-of-Botany*. 1998; 18 (6) 641-662.

Publication Year: 1998

Language: English

Abstract: A hillside with abandoned, wooded hay meadows in Leikanger in Sogn og Fjordane county, Western Norway, was investigated in 1992-1995. A management regime combining restoration (topping) of old pollarded trees, scything and removal of hay was reintroduced in the area. The availability of light, hydrological conditions and the nutrient content of the soil were the most important factors determining development of hay meadow vegetation to forest vegetation. Indicators of shaded conditions included *Valeriana sambucifolia* and *Oxalis acetosella*, while *Anthriscus sylvestris* was indicator of light conditions. Species such as *Campanula rotundifolia*, *Pimpinella saxifraga*, *Plantago lanceolata*, *Lychnis viscaria* and *Hieracium pilosella*, which were recorded mostly on dry ridges, were regarded as "relict" species, more common formerly when the area was managed in a traditional way. The cover of tall grasses and herbs, such as *Dactylis glomerata*, *Poa trivialis* and *Anthriscus sylvestris*, increased the first two years after restoration. This indicates an increase in available nutrients, probably a "pioneer clearing fertilization" due to the introduced pollarding. Restoration and management resulted in drier, more homogenous ecological conditions and reduced the differences in local climate between formerly open meadows and more wooded areas in the restored area. However, most of the vegetation seemed to be quite stable during the study period. One class, however, comprised relevés from several unstable plots of the experimental site. The frequency of some light-demanding species increased in the experimental site, while the frequency of *Oxalis acetosella* and *Epilobium montanum* increased in the control site.

**Bedmar, F., Leaden, M. I., Castano, J., 1996**

Title: Evaluation of sulfonylurea herbicides for weed control in cocksfoot (*Dactylis glomerata*).

Language: English

Subjects: Sulfonylurea compounds, Weeds/Chemical control, Orchard grass, Forage plants/Diseases and pests/Therapy

Feature Article.

Source: *Annals of Applied Biology*.

ISSN: 0003-4746.

Volume/Issue: 128 supp.

Pages: 32-3.

Date: S 1996.

Year: 1996.

Record Type: article.

Physical Description: il.

**Bogdanowicz-Lech; Szanser-Maciej, 1997**

Title: The decomposition rate of *Dactylis glomerata* grass litter in meadow ecosystems differing in age and management.

Source: *Ekologia-Polska*. 1997; 45 (3-4) 647-663.

Publication Year: 1997

Language: English

Abstract: The way of grass (*Dactylis glomerata*) aboveground parts decomposition on meadows differing both in age and management was compared. The investigations were carried in mosaic landscape (Suwalki Landscape Park) in north-eastern Poland. Experiment with using the identical for all meadows substratum (sand) for comparing the litter loss rate between meadows was carried. During three years studies (1987-89) it was found that landscape relief, age and management of meadow use influenced the rate of litter loss. Decomposition of litter on sandy substrate clearly reflected the course of its decomposition on soil surface but the values of loss rates were lower than on soil.

**Boscagli-A {A}, 1989**

Title: Effects Of Late Summer Burning In A Mediterranean Pasture.

Source: *Ecologia-Mediterranea*. 1989; 15 (1-2): 35-44.

Publication Year: 1989

Language: ENGLISH

Abstract: An experiment on the use of three burning schedules (annual, biennial and occasional) in a pasture dominated by the perennial Mediterranean grasses *Dactylis glomerata* ssp. *hispanica* (Roth) Nyman and *Phleum pratense* ssp. *bertolonii* (DC) Borum, is reported. If not repeated annually or biennially, burning increased the occurrence of legumes and decreased the dominance of the grasses. When repeated the

effect on herbage yield and pasture stability was extremely detrimental.

**Bretagnolle, F., Thompson, J. D., Lumaret, R., 1995**

Title: The influence of seed size variation on seed germination and seedling vigour in diploid and tetraploid *Dactylis glomerata* L..

Language: English

Subjects: Seeds/Weight and measurements, Orchard grass, Chromosomes/Tetraploidy/Plants, Chromosomes/Diploidy/Plants, Germination/Seedling emergence

Feature Article.

Source: *Annals of Botany*.

ISSN: 0305-7364.

Volume/Issue: 76.

Pages: 607-15.

Date: D '95.

Year: 1995.

Record Type: article.

Physical Description: bibl il.

**Brock, J. L., Hume, D. E., Fletcher, R. H. 1996**

Title: Seasonal variation in the morphology of perennial ryegrass (*Lolium perenne*) and cocksfoot (*Dactylis glomerata*) plants and populations in pastures under intensive sheep grazing.

Language: English

Subjects: Seasonal variation (Biology)/Plants, Grazing/Sheep, Botany/Morphology, Pastures and meadows/Yield/Grazing experiments, English ryegrass, Orchard grass

Feature Article.

Source: *The Journal of Agricultural Science*.

ISSN: 0021-8596.

Volume/Issue: 126.

Pages: 37-51.

Date: F '96.

Year: 1996.

Record Type: article.

Physical Description: bibl il.

**Brown-RM, 1972**

TITLE: Further trials with atrazine for controlling grass weeds in British forestry.

SOURCE (BIBLIOGRAPHIC CITATION): Proceedings 11th British Weed Control Conference. 1972, 591-600; 2 ref.

ABSTRACT: In trials in S. England in 1971 and '72 atrazine w.p. at 6kg/ha applied in mid-March or mid-May gave adequate control of *Deschampsia caespitosa* and *Dactylis*

glomerata, with the May application providing superior persistence. The addition of a non-phytotoxic oil to the spray liquid at 5% of its volume improved control but slightly increased crop damage. Granular atrazine at 3.8 to 7.7 kg/ha provided good control of fine and soft grasses but was slightly inferior to the w.p. formulation at equivalent rates. Tolerance studies confirmed that in general atrazine at rates up to 6 kg/ha can be applied to most conifers with little or no damage. Norway spruce (*Picea abies*) and western hemlock (*Tsuga heterophylla*) were more sensitive than other species to the May application at 6 kg/ha. Some revision of existing recommendations for the use of atrazine in forests is suggested.

DESCRIPTORS: atrazine-; usage-; mixtures-; oils-; crops-; damage-; forests-; weed-control; analysis-; residues-; soil-; herbicides-; application-; sprays-; grasses-; control-; plantations-; chemicals-

### **Brown-D, 1995**

TITLE: The impact of species introduced to control tree invasion on the vegetation of an electrical utility right-of-way.

SOURCE (BIBLIOGRAPHIC CITATION): Canadian-Journal-of-Botany. 1995, 73: 8, 1217-1228; 39 ref.

ABSTRACT: A project set up to determine if seeding with cover crops affects the composition of rights-of-way vegetation, and to what extent the resulting community affects the time course of succession towards a forest, is described. Four cover crops (*Festuca rubra*, *Dactylis glomerata*, *Lotus corniculatus* and *Coronilla varia*) were evaluated for a 50-year period at a site near Tobermory, Ontario. The cover and abundance of all vegetation were assessed annually, and the ordination programme Decorana was used to investigate the changes in the vegetation over time. To provide a measure of the effect of the crops on tree growth, 1-year-old transplants of *Fraxinus pennsylvanica* and *Acer saccharum*, and unrooted cuttings of *Populus X canadensis*, were planted into each plot. *Dactylis* had the greatest effect on the vegetation. This grass reduced forb biomass by 70%, producing a community with significantly lower species richness. The time trajectories of the ordination indicated that this treatment changes the overall development of the plant community. In addition, the survival of *Fraxinus* and *Populus* planted into the *Dactylis* plots was reduced to 79 and 0% of the unseeded controls, resp. These results indicate that some crops are capable of altering the community composition in the early stages of development, and may inhibit the establishment of trees.

DESCRIPTORS: impact-; species-; control-; invasion-; vegetation-; woody-weeds; weed-control; volunteer-plants; rights-of-way; cultural-control; cover-crops; weeds-; plant-communities; plant-succession; population-dynamics; species-diversity; techniques-; computer-techniques; survival-; ecology-; weed-competition; forest-trees; broadleaves-

### **Buckland-S-M {a}; Thompson-K; Hodgson-J-G; Grime-J-P, 2001**

Title: Grassland invasions: Effects of manipulations of climate and management.

Source: *Journal-of-Applied-Ecology*. [print] April, 2001; 38 (2): 301-309.

Publication Year: 2001

Language: English

Abstract: 1. Climate change, in combination with the impacts of land use, will give rise to new opportunities for grassland invasion. This paper reports on the repercussions of a field experiment. 2. Plant species, sown into experimental plots as part of a 6-year study investigating factors limiting the success of seedling invasions, were resurveyed in 1999, 3 years after terminating experimental manipulations of climate, soil fertility and disturbance. 3. The most dramatic observation was the protracted expansion in populations of *Brachypodium pinnatum*, despite being at the northern limit of its distribution in Britain. In contrast, all other sown species, including those of both southern and widespread distribution in Britain, had become extinct, declined or remained unchanged in abundance. 4. Patterns of establishment were strongly deterministic. Populations of the southern grass, *B. pinnatum*, were highest in areas of the experimental plots unamended by fertilizer and physical disturbance, but expansion was apparently promoted by cessation of management. Among invaders of widespread distribution, two were dependent upon fertilizer addition (*Arrhenatherum elatius* and *Dactylis glomerata*), one significantly increased its cover with a combination of fertilizer and disturbance (*Holcus lanatus*), and one benefited from disturbance (*Plantago lanceolata*). 5. Two southern perennials, *Origanum vulgare* and *Senecio erucifolius*, both remained present in 1999 in plots that were formerly heated and subject to drought (1991-96), whereas they had become extinct in control plots. 6. Although the most successful invader was a rhizomatous perennial grass, an alternative strategy for survival and expansion was revealed after the severe drought in 1995: gap recolonization by annuals with a persistent seed bank. 7. Most notably, this study revealed the hidden potential of a native species to establish beyond its current range of distribution and, contrary to many ! recognized weeds, the capacity to achieve dominance in the absence of eutrophication or disturbance. This highlights the potent effects of climate change when plant traits effective for establishment coincide with the removal of current barriers to dispersal.

**Caloin-M {A}; Clement-B; Herrmann-S, 1991**

Title: Regrowth Kinetics Of *Dactylis-Glomerata* Following Root Excision.

Source: *Annals-of-Botany-London*. 1991; 68 (5): 435-440.

Publication Year: 1991

Language: ENGLISH

Abstract: The growth kinetics of *Dactylis glomerata* following a root excision were studied in order to characterize the process of partitioning of carbon assimilates between shoots and roots. Plants were grown hydroponically, in constant environments. The variations with time of shoot and root fresh weights during regrowth were measured using a non-destructive method. The effect of root excision on shoot and root water contents was also determined from complementary experiments.

Immediately after cutting, the specific growth rate increased markedly for roots and decreased slightly for shoots, but this decrease can be at least partly accounted for by the variation of the shoot water content. At the end of the perturbed phase, the specific growth rates and the root fraction had almost returned to the values measured immediately before cutting. The experimental regrowth kinetics were analysed in terms of a kinetic model which calculates shoot and root growth as the difference ! between the carbon provided by photosynthesis and carbon losses associated with respiration. A satisfactory description of the regrowth kinetics was obtained by assuming that the partitioning of carbon substrates between shoots and roots is not modified by cutting, and that the partitioning coefficient remains constant during regrowth. According to this analysis, the stimulation of root growth after cutting can be mainly attributed to the reduction of the part of carbon substrates utilized in roots for maintenance requirements.

**Campbell-A-W; Guy-P-L {a}, 2001**

Title: Cocksfoot mottle virus spreads to the South Island of New Zealand.

Source: Australasian-Plant-Pathology. [print] 2001; 30 (3): 217-220.

Publication Year: 2001

Language: English

Abstract: In previous surveys of New Zealand cocksfoot (*Dactylis glomerata* L.) pastures, Cocksfoot mottle virus (CoMV) was detected at only one site near Taupo on the North Island. However, we have recently found CoMV at two sites near Dunedin on the South Island. Isolates from these sites, associated with mild and severe symptoms in cocksfoot (CoMV-Wa and CoMV-Ok, respectively), were partially characterised. In agarose gels, the virions of the two isolates had slightly different mobilities when subjected to an electric field, indicating a difference in net surface charge. However, both isolates produced similar leaf mottle symptoms in wheat, their capsid proteins had similar molecular weights ( $M_r$ =ca. 31 kDa) as determined by SDS-polyacrylamide gel electrophoresis and they were serologically indistinguishable in double-diffusion tests using 17 antisera to 10 sobemoviruses. CoMV-Ok and CoMV-Wa were serologically related to Lucerne transient streak virus but not to eight other sobemoviruses. Further surveys using DAS-ELISA showed variable incidences of CoMV (range 0-80%) at nine South Island sites. The beetle vectors of CoMV have not been introduced into New Zealand. At two sites where CoMV was found, we observed severe feeding damage from armyworms (*Persectania avera* Walker). However, in growth-cabinet experiments this species failed to transmit the virus. Incidences were significantly higher at mown sites (39%) than at unmown sites (11%), suggesting that mechanical transmission is responsible for spread. In view of the increased use of cocksfoot on New Zealand farms, the impact of CoMV on cocksfoot productivity now needs to be assessed and current levels of resistance to CoMV in commercial cultivars need to be evaluated.

**Catherall, P. L. 1987**

Title: Selection of cocksfoots (*Dactylis glomerata*) with resistances to cocksfoot mottle virus.

Language: English

Subjects: Orchard grass, Grasses/Disease and pest resistance, Cocksfoot mottle virus  
Feature Article.

Source: *Annals of Applied Biology*.

ISSN: 0003-4746.

Volume/Issue: 110 supp.

Pages: 144-5.

Date: Ap 1987.

Year: 1987.

Record Type: article.

Physical Description: bibl il.

**Clay-Keith {a}; Marks-Susan; Cheplick-Gregory-P, 1993.**

Title: Effects of insect herbivory and fungal endophyte infection on competitive interactions among grasses.

Source: *Ecology-Washington-D-C*. 1993; 74 (6) 1767-1777.

Publication Year: 1993

Language: English

Abstract: Interactions among plants may be influenced by pests or parasites that differentially affect one competitor. The purpose of this study was to determine the effects of fungal parasitism and insect herbivory, alone and in concert, on plant competitive interactions. The effects of fungal endophyte (*Acremonium* spp.) infection and fall armyworm (*Spodoptera frugiperda*) herbivory on competitive interactions in one- and two-species mixtures of the grasses tall fescue (*Festuca arundinacea*), red fescue (*F. rubra*), and perennial ryegrass (*Lolium perenne*) were examined in greenhouse experiments. In general, herbivory reduced plant biomass whereas endophyte infection increased plant biomass. Endophyte-infected (E+) plants were less damaged by herbivory than uninfected (E-) plants of the same species. Studies on fall armyworm larval feeding and choice tests with the five grass species were generally consistent with the outcome of the competition experiments; E+ plants were less nutritious and less preferred than E- plants of the same species. There were significant interactions among factors so that the outcome of competition depended on the species identities and the presence or absence of endophytes and herbivores. In competition with Kentucky bluegrass (*Poa pratensis*), E+ and E- perennial ryegrass produced similar biomass in the absence of herbivory, but E+ perennial ryegrass had nearly twice the biomass of E- plants when herbivores were present. E+ and E- tall fescue were poor competitors with orchard grass (*Dactylis glomerata*) when herbivores were absent, but E+ tall fescue was a better competitor than E- plants and orchard grass when herbivores were present. This study indicates that competitive hierarchies among grasses are

altered by interactions with insect herbivores and fungal endophytes, which have typically been ignored in past studies.

**Coackley-A; Moore-RW, 1977**

TITLE: DPX 3674 - a broad spectrum herbicide for weed control in forestry.

SOURCE (BIBLIOGRAPHIC CITATION): Proceedings of the 30th New Zealand Weed and Pest Control Conference 1977. 233-237.

ABSTRACT: Trials conducted during the years 1974-76 in different forest locations in New Zealand showed that DPX 3674 (hexazinone) could control a wide range of weeds in Monterey pine (*Pinus radiata*). Excellent control of grasses such as Yorkshire fog (*Holcus lanatus*), brown top (*Agrostis tenuis*) and cocksfoot (*Dactylis glomerata*) was obtained at rates of 1.8-5.4 kg/ha while on bracken (*Pteridium aquilinum* var. *esculentum*) 5.4-7.2 kg/ha was required. Rates of 5.4-10.8 kg/ha also proved effective on wattle (*Acacia decurrens*) and broom (*Cytisus scoparius*). The best time of application was when weeds were actively growing during the early season flush, commencing mid-September in the Central North Island.

DESCRIPTORS: control-; chemicals-; hexazinone-; usage-; crops-; forests-; plantations-; weed-control; HERBICIDES-; picloram-; 2,4,5-T

**Coates-K-David {a}; Douglas-Mary-Jane; Schwab-James-W {a}; Bergerud-Wendy-A, 1993.**

Title: Grass and legume seeding on a scarified coastal alluvial site in northwestern British Columbia: Response of native non-crop vegetation and planted Sitka spruce (*Picea sitchensis* (Bong.) Carr.) seedlings.

Source: New-Forests. 1993; 7 (3) 193-211.

Publication Year: 1993

Language: English

Abstract: The success of various grass-legume mixtures in controlling competing vegetation, and their effect on subsequent survival and growth of Sitka spruce seedlings was studied on a coastal alluvial site in northwestern British Columbia. Mechanically scarified (bladed) strips were hand seeded to pure and combined mixtures of legumes, bunchgrasses, and sodforming grasses. An unseeded control (bladed but not seeded) was also established. Alsike clover (*Trifolium hybridum* L.) was the most successful legume species. Orchardgrass (*Dactylis glomerata* L.), big bluegrass (*Poa ampla* Merr.), and creeping red fescue (*Festuca rubra* L.) were the most successful grass species. Red alder (*Alnus rubra* Bong.) density and height were lower in legume-seeded treatments. Red elderberry (*Sambucus racemosa* L.) and salmonberry (*Rubus spectabilis* Pursh.) were effectively reduced by blading and have reestablished slowly. A combination of blading and early establishment of either sodforming grasses or bunchgrasses effectively decreased reinvasion by thimbleberry (*Rubus parviflorus* Nutt.). Growth of Sitka spruce was best in the unseeded control treatment or in the treatments with legumes but no sodforming grasses. Presence of sodforming grasses decreased both



diameter and height growth. Sitka spruce diameter decreased with increasing red alder density. After 5 growing seasons, spruce has outgrown all competitors except red alder.

**Crothers-J-H {A}, 1991**

Title: The Nettlecombe Grassland Experiment 1968-1990 Student Investigations Of Continuity And Change In A Grassland Sward.

Source: Field-Studies. 1991; 7 (4): 687-717.

Publication Year: 1991

Language: ENGLISH

Abstract: The Nettlecombe Grassland Experiment was established, in March 1968, as a vehicle for teaching vegetation sampling techniques to A-level biologists. Four treatments (A: mown fortnightly during the growing season, B: mown annually in June, C: unmown, and D: cleared in March 1968 and subsequently unmown) are arranged in a 4 .times. 4 Latin Square. One hundred, randomly distributed, point quadrats are taken in each plot. The vegetation is grouped into eight taxa-6 species [Dactylis glomerata, Holcus lanatus, Rhytidiadelphus squarrosus, Ranunculus, repens, Trifolium repens, Achillea millefolium] and the rest in one of two "catch-all" categories [other grasses and other plants]. By the end of November 1990, 120 sets of data had been obtained by a wide range of students and the resulting patterns are briefly analysed. Initially, the differential effects of the mowing regimes dominated the results but, latterly, long-term trends, related in part to climatic changes, have influenced the patterns. Ant hills have also complicated the issue since 1982. As a teaching resource, the data derived from the experiment justify the sampling technique and, through its various failings, the experiment itself encourages discussion on the manner in which such investigations should be planned.

**De Montard, F. X., Rapey, H., Delpy, R. 1999**

Title: Competition for light, water and nitrogen in an association of hazel (*Corylus avellana* L.) and cocksfoot (*Dactylis glomerata* L.).

Language: English

Subjects: Orchard grass, European hazelnuts, Plant competition, Agroforestry/France Feature Article.

Source: Agroforestry Systems.

ISSN: 0167-4366.

Volume/Issue: 43 no1-3.

Pages: 135-50.

Date: 1998/1999.

Year: 1999.

Record Type: article.

Physical Description: bibl il.

**Fraser, Joanna, Kokko, Eric G. 1993**

Title: Panicle, spikelet, and floret development in orchardgrass (*Dactylis glomerata*).

Language: English

Subjects: Orchard grass, Flower development, Spike (Panicles)

Feature Article.

Source: Canadian Journal of Botany.

ISSN: 0008-4026.

Volume/Issue: 71.

Pages: 523-32.

Date: Ap 1993.

Year: 1993.

Record Type: article.

Physical Description: bibl il.

**Garnier, E., Roy, J. 1988**

Title: Modular and demographic analysis of plant leaf area in sward and woodland populations of *Dactylis glomerata* and *Bromus erectus*.

Language: English

Subjects: Plant population, Forest ecology/France, Orchard grass, Erect brome grass

Feature Article.

Source: The Journal of Ecology.

ISSN: 0022-0477.

Volume/Issue: 76.

Pages: 729-43.

Date: S '88.

Year: 1988.

Record Type: article.

Physical Description: bibl il.

**Gough-R-E {a}; Carlstrom-R, 1999**

Title: Wheat gluten meal inhibits germination and growth of broadleaf and grassy weeds.

Source: Hortscience-. April, 1999; 34 (2): 269-270.

Publication Year: 1999

Language: English

Abstract: The herbicidal activity of wheat gluten meal (WGM) was evaluated on 17 species of monocotyledons and dicotyledons. Treatments included WGM at 0, 1, 2, 3, 4, 6, and 9 gcntdotdm-2. Germination, shoot and root lengths, and root numbers were recorded. Treatments reduced germination and root extension in nearly all species. Leafy spurge (*Euphorbia esula* L.), redroot pigweed (*Amaranthus retroflexus* L.), shepherd's purse (*Capsella bursa-pastoris* (L.) Medik.), henbit (*Lamium amplexicaule* L.), quackgrass (*Agropyron repens* (L.) Beauv.), annual bluegrass (*Poa annua* L.), Canada thistle (*Cirsium arvense* (L.) Scop.), orchardgrass (*Dactylis glomerata* L.),

purslane (*Portulaca oleracea* L.), annual ryegrass (*Lolium multiflorum* Lam.), and snap bean (*Phaseolus vulgaris* L.) were particularly sensitive. Germination of curly dock (*Rumex crispus* L.) and common lambsquarters (*Chenopodium album* L.) was suppressed at the higher rates. Germination of black medic (*Medicago lupulina* L.), spotted knapweed (*Centaurea maculosa* Lam.), mustard (*Brassica* sp.), and corn (*Zea mays* L.) were not substantially affected at any rate. Shoot growth of all species was inhibited at rates  $>2 \text{ g cm}^{-2}$ , and at the highest rates no shoots developed. In nine species, shoot extension was stimulated at  $1 \text{ g cm}^{-2}$  WGM. The herbicidal activity of WGM was not due to a "mulching" effect, since growth characteristics were also altered in bean seeds barely covered by the treatments.

**Gurevitch-J {A}; Wilson-P; Stone-J-L; Teese-P; Stoutenburgh-R-J, 1990**

Title: Competition Among Old-Field Perennials At Different Levels Of Soil Fertility And Available Space.

Source: *Journal-of-Ecology*. 1990; 78 (3): 727-744.

Publication Year: 1990

Language: ENGLISH

Abstract: Competitive effects and responses to neighbours were examined by growing plants of three species (*Achillea millefolium*, *Dactylis glomerata* and *Vicia cracca*) singly and in intra- and interspecific pairs at low and at moderate substrate fertility. The effects of neighbours were distinguished from the effects of a reduction in available space by growing plants across a range of pot sizes. Focal plants were affected by a simple reduction in available space differently than by the presence of competing neighbours. The effects of neighbours were complex, and depended on the species that were competing and on how the effect was measured. Competition did not generally have greater negative effects on plant performance (using several measures of performance) at higher fertility levels and when more space was available. Nor was there a tendency for greater competitive effects at lower soil fertility and when space was more restricted. There were no apparent trade-offs in competitive abilities at different resource levels. The negative effects of competition on an individual plant's growth, for the poorer competitor of a pair, was greater if the neighbour was of a different species than if the neighbour was a conspecific. There was a generally consistent hierarchy of competitive effects and responses among species that reflected the hierarchy of initial seed sizes. Root:shoot ratios differed among species and were altered by available space (pot size), fertility level and neighbour identity. Root:shoot ratios were most variable in response to neighbour identity in *Achillea*, the poorest competitor, and least responsive in *Vicia*, generally the best competitor.

**Hulme-Philip-E, 1996**

Title: Herbivores and the performance of grassland plants: A comparison of arthropod, mollusc and rodent herbivory.

Source: *Journal-of-Ecology*. 1996; 84 (1) 43-51.

Publication Year: 1996

Language: English

Abstract: 1 A field experiment involving enclosure techniques was used to assess the relative roles of arthropods, molluscs and rodent herbivores in the survival and growth of temperate grassland plants. The study focused on the impact of herbivores on plant survival, above-ground biomass and root weight ratios of 21 plant species which were sown experimentally in a grassland and meadow. 2 Of the three herbivore groups studied, rodents exerted the greatest influence on plant performance, reducing plant biomass by as much as 50% and substantially increasing plant mortality. Molluscs significantly decreased plant numbers but plants appeared more able to compensate for biomass lost through grazing. By comparison, arthropods played only a minor role in determining either plant biomass or survival. 3 Positive correlations in the responses of plant species to herbivory by molluscs and rodents indicate that the major difference in the impact of these two guilds of herbivores on plant performance (survival, biomass and root weight ratio) is in the magnitude rather than the direction of the plant response. Legumes were more susceptible to herbivory than grasses, exhibiting both lower survival and greater loss of biomass. 4 Results indicate that where resources are limiting, as in the meadow, the direct influence of herbivores on plant numbers is minimal since herbivore induced mortality is only one component of naturally low plant survival. In contrast, the influence of herbivores on plant growth can be considerable since plants are often unable to compensate for tissue loss via regrowth. Thus, in the grassland, the overall influence of herbivores was on plant numbers whereas in the meadow their main impact was on mean plant biomass. 5 Although the majority of the variation in both plant survival and biomass occurred independently of the experimental treatments, with almost 50% attributable to intrinsic species effects, indirect evidence reveals herbivores to have an impact on plant community composition. Plants which suffer both high mortality and poor growth as a result of herbivory (e.g. *Trifolium repens*, *T. pratense*) are rare while those plants whose performance is little influenced by herbivores (e.g. *Agrostis capillaris*, *Dactylis glomerata*, *Plantago lanceolata*) are abundant in the grassland communities studied.

**Kajak-Anna {a}; Makulec-Grzegorz {a}; Bogdanowicz-Lech {a}; Chmielewski-Krzysztof {a}; Kaczmarek-Maria {a}; Kusinska-Alina; Lakomic-Ignacy, 1992**

Title: Experimental studies on the decomposition of *Dactylis glomerata* L. grass litter on meadows varying in the complexity of vegetation.

Source: *Ekologia-Polska*. 1992; 39 (1) 113-134.

Publication Year: 1992

Language: English

Abstract: Decomposition of grass litter dynamics was compared in two adjoining grasslands established on the same type of soil, in new (second year after tillage) and old one (eight years after tillage). It was found, that higher proportion of nutrients released from the litter is retained in soil organic matter of older grassland. 26.7% N,

13% C is retained in soil of old grassland and 10.5% N, 7% C in new one. An attempt was made to find evidence that the differences in decomposition obtained, are related with higher biomass and diversity of soil fauna in old meadow.

**Kajak-Anna; Wasilewska-Lucyna, 1997**

Title: Changes in meadow ecosystems as consequence of secondary succession and plant diversity (synthesis of research).

Source: Ekologia-Polska. 1997; 45 (3-4) 839-859.

Publication Year: 1997

Language: English

Abstract: The decomposition process of *Dactylis glomerata* and the accumulation rate of organic matter was compared in meadows differing in the time since tillage ceased. Over time number of plant species in the sward and the diversity of the majority of analysed invertebrate groups increased. The youngest meadows were characterized by maximal variability in environmental conditions and variation in the numbers of several dominant invertebrate populations. Litter bags exposed in this meadow were colonized rapidly by bacteria, but slowly by microarthropods, compared to older meadows. The lowest accumulation of total organic carbon and humus fractions was also found in mesocosms inserted in soil profile of these meadows. The community structure of invertebrates colonizing mesocosms was characteristic for ecosystems under stress. Relatively high proportion of small organisms (bacteria, bacteriphagic invertebrates) stimulating the mineralization rate of organic matter were recorded.

**McCavish-W, 1980**

TITLE: Forest weed control.

SOURCE (BIBLIOGRAPHIC CITATION): 1980, 11-12.

ABSTRACT: In lowland Britain a repeat treatment with hexazinone at 1.8 and 2.7 kg/ha controlled all soft grasses including *Calamagrostis epigejos*, *Dactylis glomerata* and *Deschampsia caespitosa* without injuring Corsican pine or Sitka spruce; the last named grasses were also well controlled by terbuthylazine at 4 and 8 kg/ha. Good control of *Arrhenatherum elatius* was obtained with a new granule containing atrazine and dalapon at 10%/10% w/w, applied at 40 and 80 kg/ha. Triclopyr ester at 1.2 to 2.4 kg/ha gave excellent control of *Ulex gallii* and of deciduous woody weeds; it was less harmful to desired species than glyphosate, which in any case did not control gorse and broom [*Cytisus scoparius*] satisfactorily. Control of heather [*Calluna vulgaris*] with glyphosate at 0.54 to 1.08 kg/ha was good where annual rainfall was high but poor with low rainfall.

DESCRIPTORS: woody-weeds; atrazine-; dalapon-; hexazinone-; usage-; crops-; forests-; glyphosate-; terbuthylazine-; triclopyr-; mixtures-

**McCavish-WJ, 1980**

TITLE: Hexazinone - a new forest herbicide.

SOURCE (BIBLIOGRAPHIC CITATION): Proceedings of the Conference on Weed Control in Forestry, Nottingham, 1980. 1980, 217-225; 10 ref.

ABSTRACT: Hexazinone (Velpar) is a broad spectrum herbicide. Grasses such as *Dactylis glomerata*, *Deschampsia caespitosa* and *Calamagrostis epigejos* are well controlled by treatment with 1.8 kg a.i./ha in early spring. *Urtica dioica* was well controlled at one site and several other herbaceous broad-leaved weeds such as *Cirsium arvense* were susceptible at this rate. Several conifer species showed good tolerance to hexazinone, e.g. *Picea sitchensis*, *Picea abies*, *Pinus sylvestris*, *Pinus contorta* and *Pinus nigra* var *maritima*. However overall sprays at medium volume did cause damage if applied during the active growing period, e.g. in April, May and June. Particularly susceptible was *Larix kaempferi* [= *L. leptolepis*] while *Pseudotsuga menziesii* and *Tsuga heterophylla* had moderate to severe damage. Tolerance testing was, however, on bare earth nursery conditions which may have exaggerated the level of damage. From summary.

DESCRIPTORS: hexazinone-; usage-; crops-; forests-; selectivity-; control-; chemicals-; weed-control; herbicides-; nurseries-; plantations-

### **McDonald-PM; Fiddler-GO, 1999**

TITLE: Effect of cattle grazing, seeded grass, and an herbicide on ponderosa pine seedling survival and growth.

SOURCE (BIBLIOGRAPHIC CITATION): Research-Paper -Pacific-Southwest-Research-Station,-USDA-Forest-Service. 1999, No. PSW-RP-242, iii + 15 pp.; 31 ref.

ABSTRACT: On a site of above-average quality in northern California planted in with *Pinus ponderosa* in spring 1987, an early shrub-forb-grass plant community was treated by artificially sowing two forage grass species (*Dactylis glomerata* and *Agropyron trichophorum* [*Elymus hispidus* subsp. *barbulatus*]) at plantation age 3 (October 1989), cattle grazing with and without sown grasses in 1988, 1989, 1991, 1994 and 1996, and applying a soil-active chemical (Velpar [hexazinone]) in March 1988. Results for a 10-year period (1988-1997) are presented for planted pines, manzanita, other shrubs, forbs, and grasses (natural and seeded). In general, the pines, manzanita (*Arctostaphylos* spp.), and grasses were numerous and developing well after 10 years, and the other shrubs and forbs were declining in density or foliar cover or both. Velpar was the only treatment that significantly improved pine seedling growth. Grazing did not. The sown (introduced) grasses, which were heavily grazed, probably reduced damage to the pines. The grasses also helped reduce manzanita foliar cover when grazed. No evidence was found that the introduced grasses served as a biological control in terms of reducing the density of manzanita or other shrubs.

DESCRIPTORS: grazing-; herbicides-; seedlings-; survival-; biological-control; forage-; plant-communities; seedling-growth; shrubs-; forest-plantations; agroforestry-systems; silvopastoral-systems; undersowing-; weed-control; chemical-control; hexazinone-; vegetation-management; increment-; plant-height; soil-fertility; forest-soils

**Ogawa-Y {A}; Fukuda-E; Okamoto-K, 1989**

Title: Effect Of Litter Layers On The Growth Of Orchardgrass *Dactylis-Glomerata* L. Oversown In The Cutover Land Of Deciduous Broad-Leaved Forest.

Source: Grassland-Science. 1989; 35 (2): 134-140.

Publication Year: 1989

Language: JAPANESE

Abstract: A series of field experiments was carried out in cutover land of forest, in order to develop the low-input method of pasture establishment with effective use of tree litter sources. In this report, the effect of litter layers on the productivity of *Dactylis glomerata* pasture established on the cutover land of deciduous broad-leaved forest without chemical fertilizers is presented. L, F and H layers on the forest floor were perfectly remained in the experimental field just after clear cutting. Fresh tree leaf litter was 0.69 DM kg/m<sup>2</sup> in L and F layers, and decayed one with soil particles was 2.24 DM kg/m<sup>2</sup> in H layer. Three kinds of seed-bed preparation plots were conducted with different degrees of disturbance of these litter layers: I; Removing the whole litter layers, II; Removing L and F layers, III; No disturbance. On August 14 of 1982, one week after seed-bed preparations, *D. glomerata* was oversown without chemical fertilizers in each plot. Nitrogen mineralization activity under incubating condition was also compared among the three types of tree leaf litter in each layer to know the effect of their nitrogen sources on the growth of *D. glomerata*. Results are summarized as follows: 1. The maximum plant height and tiller number per plant of *D. glomerata* were obtained in the III plot. In June of 1983, 10 months after sowing, standing crop weights of *D. glomerata* were 12.2, 23.6 and 58.2 DM kg/m<sup>2</sup> in the I, II and III plots, respectively. 2. Fresh tree leaf litter in L and F layers, only remained in the III plot, had higher contents of N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, MgO and CaO than those of decayed one in H layer. The uptake amounts of those minerals in the top of *D. glomerata* in the III plot were 4 to 6 times more than in the I plot. 3. The amounts of inorganic nitrogen released from tree leaf litter after 8 weeks of incubation were 1.56, 0.92 and 0.62 mg/g litter in L, F and H layers. On a per hectare basis, those amounts were 3.6, 4.2 and 13.9 kg N/ha, respectively. However, nitrogen mineralization activity of the surface soil was much lower than that of tree leaf litter. Litter sources remained in the cutover land of deciduous broad-leaved forest was considered to be very useful for the growth of *D. glomerata*, especially in the case of free tree leaf litter in L and F layers. Low-input method of pasture establishment was discussed in relation to the comparison of yields between two pastures of *D. glomerata* established on the cutover land with or without chemical fertilizer.

**Perez-Fernandez-J {A}; Welty-R-E, 1991**

Title: Histopathology Of Orchardgrass Infected By *Rhynchosporium-Orthosporum*.

Source: Mycologia-. 1991; 83 (6): 774-778.

Publication Year: 1991

Language: ENGLISH

Abstract: Penetration and colonization of orchardgrass [*Dactylis glomerata*,] by *Rhynchosporium* and production of conidia by the fungus were investigated by light, fluorescent, and scanning electron microscopy. Conidia of *R. orthosporum* germinated to produce an appressorium, and the fungus penetrated directly through adaxial or abaxial leaf surfaces. After penetration, mycelium proliferated in the intercellular subcuticular region. Hyphae became intracellular after disintegration and death of the mesophyll cells. At this stage, symptoms were evident on leaf blades as irregular lenticular lesions. Conidia were produced on leaf surfaces from subcuticular mycelium on short conidiophores that extruded through stomata and cuticular holes. During early stages of tissue colonization, masses of conidia developed and matured on and above the intact cuticle. Subcuticular mycelium remained protected by the cuticle for most of the period of spore production.

**Revell-D; Deadman-H, 1975**

TITLE: Planted hardwoods and weed competition.

SOURCE (BIBLIOGRAPHIC CITATION): Proceedings of the F.R.I. Symposium No. 18: The Use of Herbicides in Forestry in New Zealand, 1975. 1976, 133-137.

ABSTRACT: In trials at Esk forest, the effect of herbicide treatments on the growth of poplar (*Populus* sp.) and eucalypt seedlings was compared with that of applications of fertilizer. The herbicide treatment consisted of paraquat + simazine at 0.83 mlitres + 0.66 g in 200 mlitres of water/poplar seedling applied to a 1-metre radius round the tree, and at 5.5 litres + 4 kg/ha sprayed overall before planting *Eucalyptus regnans* and *E. nitens*. Grass weeds, which predominated in the area, included *Dactylis glomerata* and *Lolium* spp. In both crop species best growth increments followed the application of both herbicides and fertilizer; increments were significantly greater from herbicides alone than from fertilizer alone, particularly in the case of poplars.

DESCRIPTORS: paraquat-; simazine-; usage-; crops-; forests-; mixtures-; compatibility-; poplars-

**Sherwood, R. T., Berg, C. C. 1991**

Title: Anatomy and lignin content in relation to resistance of *Dactylis glomerata* to *Stagonospora* leaf spot.

Language: English

Subjects: Grasses/Disease and pest resistance, *Stagonospora arenaria*, *Stagonospora* plant diseases, Orchard grass, Grass leaf spots

Feature Article.

Source: *Phytopathology*.

ISSN: 0031-949X.

Volume/Issue: 81.

Pages: 1401-7.

Date: N 1991.

Year: 1991.



Record Type: article.  
Physical Description: bibl il.

**Stefaniak-Ojcumila; Slizak-Wanda; Maniewska-Roza; Gorlach-Krystyna, 1997**

Title: The impact of grass litter on the development of microorganisms in the substrate.

Source: Ekologia-Polska. 1997; 45 (3-4) 709-717.

Publication Year: 1997

Language: English

Abstract: An experiment was designed to estimate the effect of the litter made up of a single grass species (*Dactylis glomerata*) on the development of microflora (bacteria, Actinomycetes, fungi) and on enzymatic activity (dehydrogenase, cellulase, and protease) in the underlying substrate. The underlying substrate was the soil of meadows differing in age or the sand inserted to this soil. The response of microorganisms to the exposed litter was stronger in the sand than in the meadow soil. The abundance of microorganisms in the soil caused by the presence of the litter was lower in older as compared with younger meadows. This pattern did not occur in the sand inserted into the meadow soil.

**Torrance, Lesley, Jones, A. T., Duncan, G. H. 1994**

Title: Properties of cocksfoot streak and cocksfoot cryptic, two viruses infecting cocksfoot (*Dactylis glomerata*) in Scotland.

Language: English

Subjects: Orchard grass, Cocksfoot streak virus, Plant disease surveys/Scotland  
Feature Article.

Source: Annals of Applied Biology.

ISSN: 0003-4746.

Volume/Issue: 124.

Pages: 267-81.

Date: Ap 1994.

Year: 1994.

Record Type: article.

Physical Description: bibl il.

**Tsuyuzaki-Shiro {a}; Kanda-Fusayuki; Narita-Kenji, 1994**

Title: Revegetation patterns on abandoned pasture in northern Japan.

Source: Acta-Oecologica. 1994; 15 (4) 461-467.

Publication Year: 1994

Language: English

Abstract: Vegetation status on an abandoned pasture in northern Japan was investigated to obtain the determinants of vegetation development. Ten factors were selected: soil depth down to three horizons, soil texture (relative percentage of silt, sand, and gravel), soil water content, soil organic matter, light intensity at the ground

surface, and distance from the forest edge. Above- and below-ground systems of a dwarf bamboo, *Sasa senanensis*, were also measured. These data were analyzed by canonical correspondence analysis. Previously-introduced grass, i.e., *Dactylis glomerata*, remained on the abandoned pasture even 20 years after the abandonment of the pasture. While *S. senanensis* inhabits sites with deep soil by means of vegetative reproduction, mosses establish on sites with shallow soil. Soil depths that permit root expansion seem to be the most important for *S. senanensis* to elongate roots. Species richness was very low under the canopy of *S. senanensis*, which strongly intercepts light. Therefore, we conclude that soil depth is the primary determinant of vegetation development.

**Voltaire, F., Thomas, H. 1975**

Title: Effects of drought on water relations, mineral uptake, water-soluble carbohydrate accumulation and survival of two contrasting populations of cocksfoot (*Dactylis glomerata* L.) cocksfoot (*Dactylis glomerata* L.).

Language: English

Subjects: Orchard grass, Droughts/Effect on plants, Plants/Carbohydrate content, Plants/Mortality and viability, Plants/Mineral content

Feature Article.

Source: *Annals of Botany*.

ISSN: 0305-7364.

Volume/Issue: 75.

Pages: 513-24.

Date: My 1995.

Year: 1995.

Record Type: article.

Physical Description: bibl il.

**Voltaire, F. 1994**

Title: Effects of summer drought and spring defoliation on carbohydrate reserves, persistence and recovery of two populations of cocksfoot (*Dactylis glomerata*) in a Mediterranean environment.

Language: English

Subjects: Grassland ecology/Mediterranean region, Droughts/Effect on plants, Defoliation, Grasses/Carbohydrate content, Orchard grass

Feature Article.

Source: *The Journal of Agricultural Science*.

ISSN: 0021-8596.

Volume/Issue: 122.

Pages: 207-15.

Date: Ap '94.

Year: 1994.

Record Type: article.  
Physical Description: bibl il.

**Voltaire, Florence 1995**

Title: Growth, carbohydrate reserves and drought survival strategies of contrasting *Dactylis glomerata* populations in a Mediterranean environment.

Language: English

Subjects: Droughts/Effect on plants, Orchard grass, Grasses/Carbohydrate content  
Feature Article.

Source: The Journal of Applied Ecology.

ISSN: 0021-8901.

Volume/Issue: 32.

Pages: 56-66.

Date: F '95.

Year: 1995.

Record Type: article.

Physical Description: bibl il.

**Voltaire-Florence {a}; Conejero-Genevieve; Lelievre-Francois, 2001**

Title: Drought survival and dehydration tolerance in *Dactylis glomerata* and *Poa bulbosa*.

Source: Australian-Journal-of-Plant-Physiology. [print] 2001; 28 (8): 743-754.

Publication Year: 2001

Language: English

Abstract: To analyse the contribution of dormancy and dehydration tolerance to drought survival of perennial grasses, we compared *Poa bulbosa* L., which is classified as a resurrection plant, with one of the most drought resistant cultivars of Mediterranean *Dactylis glomerata* L. Comparing periods when dormancy was induced in *Poa* (summer) and not induced (winter), we aimed to ascertain the presence of differential plant responses between dormancy and dehydration tolerance and to characterise water status, sugar and dehydrin accumulation in surviving organs of *Poa* and *Dactylis*, in relation to their ability to survive intense drought. Irrespective of the dormancy status of *Poa*, the bulbs of this species had a final water content lower than 10% and survived an extreme drought. This could be associated with the accumulation of sucrose and the expression of a high number (>10) of dehydrins that peaked when the water content of the bulbs fell below 50%, whether this dehydration was due to dormancy induction or increasing soil water deficit. The independence of dormancy to dehydration tolerance was reinforced by the expression of a specific dehydrin (approx. 28 kDa) found only in irrigated, but dormant, tissues of *Poa*. The *Dactylis* exhibited contrasting survival between experiments (46 and 0% after a summer and winter drought, respectively). The mortality was associated with a significantly higher rate of decrease of the membrane stability of leaf bases of *Dactylis* in winter and with barely

detectable amounts of sucrose contents in droughted roots. However, neither the water-soluble carbohydrate concentration in leaf bases nor the overall accumulation of dehydrins could be related to the contrasting survival of this *Dactylis* between the two seasons. Since in seeds of *Poa* and *Dactylis*, the accumulation of dehydrins was comparable with that found in droughted aerial tissues of the same species, the expression of these proteins must interact with other mechanisms to confer dehydration tolerance.

### **Welch-David, 1995**

Title: Trends in the botanical composition of set-aside fields in North-East Scotland uncultivated for five years.

Source: *Botanical-Journal-of-Scotland*. 1995; 47 (2) 141-150.

Publication Year: 1995

Language: English

Abstract: Species composition was monitored in 13 set-aside fields from 1989 to 1993 and in six others from 1989 to 1991. Grasses contributed more cover than dicotyledonous species throughout, but weedy species, e.g. *Agrostis gigantea* and *Poa annua*, were steadily replaced by grasses of permanent grassland, e.g. *Agrostis capillaris*, *Dactylis glomerata* and *Holcus lanatus*. *Ranunculus repens* (creeping buttercup) and *Trifolium repens* (white clover) became the main dicotyledonous species, and weeds characteristic of arable land had negligible cover after the first year of set-aside. As a result species richness declined, herbs of semi-natural grasslands being slow to colonize; many entrant species were recorded only in edge quadrats which extended 5 m into the fields from the headland. Noxious weeds (docks, ragwort and thistles) remained at low cover levels.

### **Welch-D; Scott-D, 1995.**

Title: Studies in the grazing of heather moorland in north-east Scotland. VI. 20-Year trends in botanical composition.

Source: *Journal-of-Applied-Ecology*. 1995; 32 (3) 596-611.

Publication Year: 1995

Language: English

Abstract: 1. Botanical composition and herbivore usage were monitored over a 20-year period at 15 moorland sites; point quadrats were recorded in fixed positions. Although composition reflected soil type and altitude, *Calluna vulgaris* was initially the main species at all sites, with cover averaging 61%. 2. Grazing pressures varied from light to heavy, causing wide variation in the utilization of *Calluna* shoots. Hence, *Calluna* declined at four sites, stayed in balance or showed negligible trend at four sites, and increased at seven sites. 3. At sites with *Calluna* decline, oraminoids and forbs showed a general rise in cover, and ericoids and lichens decreased. Species increasing significantly included *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina*, *Galium saxatile*, *Luzula multiflora*, *Nardus stricta* and *Rhytidiadelphus squarrosus*;

*Deschampsia flexuosa* was reduced in cover. At one site with agricultural reseeded nearby, *Cynosurus cristatus*, *Dactylis glomerata* and *Lolium perenne* became established. 4. At sites with *Calluna* steady, changes in the main plant groups were small. Bryophytes increased modestly, the chief contributor being *Pleurozium schreberi* which replaced *Hypnum cupressiforme*. 5. At sites with *Calluna* increase, changes were greater when the *Calluna* sward was continuous rather than patchy. At the former sites graminoids and forbs declined sharply, and bryophytes increased, particularly the pleurocarpous mosses *Hylocomium splendens*, *Hypnum cupressiforme* and *Pleurozium schreberi*. 6. Species richness, as measured by the number of contacts with vascular plant species per point-quadrat pin, was much more affected by soil type than by *Calluna* trend. Species number declined somewhat at sites with *Calluna* static and increasing; at sites with *Calluna* decline, an increase in the number of herbs was offset by reduced numbers of bryophytes and lichens.

### ***Useful websites***

[www.ipm.ucdavis.edu/PMG/WEEDS/orchgrass.html](http://www.ipm.ucdavis.edu/PMG/WEEDS/orchgrass.html)

University of California, statewide IPM project.

[www.caf.wvu.edu/~forage/library/cangrass/page33.htm](http://www.caf.wvu.edu/~forage/library/cangrass/page33.htm)

West Virginia University, Identification of Grasses

[www.fs.fed.us/database/feis/plants/graminoid/dacglo/botanical\\_and\\_ecological\\_characteristics.html](http://www.fs.fed.us/database/feis/plants/graminoid/dacglo/botanical_and_ecological_characteristics.html)

US National Forest Service, Botanical and Ecological Characteristics of *D. glomerata*.

[www.biodiversity.uno.edu/delta/grass/www/dactylis.htm](http://www.biodiversity.uno.edu/delta/grass/www/dactylis.htm)

Grass genera of the world.

[http://web.css.orst.edu/Topics/Species/Grasses/Orchardgrass/International\\_Fact\\_Sheet.html](http://web.css.orst.edu/Topics/Species/Grasses/Orchardgrass/International_Fact_Sheet.html)

American Forage and Grassland Council, Orchardgrass International Fact Sheet