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Strawberry Training Systems for North Dakota Production.
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'Redcoat' strawberry plants were grown and compared for yields, fruit size, and economic value under a 2-foot-wide matted-row system and three spaced-row training systems—(1) 3 row spaced at 12 inches then allowed to mat, (2) 3 row spaced at 12 inches and additional runners removed, and (3) 3 row spaced at 6 to 8 inches with additional runners thinned. In the first harvest season, each of the three spaced-row systems produced significantly more total marketable yield and higher ratios of No. 1 berries that the matted-row system. Spaced-rows with plants at 6–8 inch intervals produced more total yield than those spaced at 12 inches, but the potential for profitability was less due to the higher cost of the pinning and pruning operations of close spacing.

Effects of Selected Plant Growth Regulators on Cranberry Fruit Set and Development.
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Selected plant growth regulators (proprietary products of Abbot Laboratories, Inc.) were applied to field-grown 'Searles' cranberries (Vaccinium macrocarpon Ait) in Wisconsin in 1986. Repeat sprays of ABG 3028C, 3035, 3073, 3001, 3062, and 3068 were applied at 100 ppm a.i. concentration at 50% bloom, 100% bloom, and 100% bloom plus 7 days. ABG 3028C (GA3), ABG 3035 (GA4+7), and ABG 3073 (undesignated) enhanced fruit set to 51–53% of total potential, compared to 26% fruit set for the untreated control. With these compounds, mean berry weight was reduced but yield was not affected, compared to the control. ABG 3062 (6-BA) suppressed fruit set to 3% of potential. ABG 3068 (undesignated) alone or with ethanol and ABG 3001 (6-BA + GA4+7) did not influence fruit set, although berry weight and yield were significantly reduced. Parthenocarpic fruit development in response to all growth regulator treatments was apparent from berry seed counts. With the exceptions of ABG 3001 and ABG 3062, growth regulator applications caused abnormal elongation of the vines and inhibited terminal bud development.

Comparison of the Disease Reaction of Beans (Phaseolus vulgaris) Inoculated by Different Methods with Isolates of Xanthomonas campestris pv. phaseoli.
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Phaseolus vulgaris cultivars: Red Kidney Charlevoix, GN Harris, GN 1140, and GN Emerson were inoculated by 3 methods of leaf (water soaking = WS, multiple needle = MN, and razor blade = RB) and pod inoculation (razor blade scratch = RBS, dissecting needle = DN, and razor blade cut = RBC) using 3 different strains of Xanthomonas campestris pv. phaseoli. There was an interaction between methods of inoculation, concentration of bacterial inoculum, and cultivars on the disease reaction of leaves. The virulence of the 3 strains on leaves were not different, but were different on pods. A rapid leaf chlorosis (RLC) developed 6–7 days after inoculation. Cultivars did not show specificity for this reaction but RLC was associated with high inoculum concentration and with WS and MN methods. In another study the number of living bacterial cells left in the leaf tissue after inoculation by WS or MN was higher than with RB. The uniformity of the disease reaction recorded after inoculation was higher for RB than for WS and MN methods.

The Effect of Storage Temperature on Sugar Accumulation in the Potato Line ND860-2 and Its Progeny Lines.

A study was conducted to compare sugar accumulation in ND860-2, Norchip, and Kennebec tubers during storage at 38° and 45°F. ND860-2 does not accumulate reducing sugars at low temperatures to the same extent as commonly used cultivars. The results of this study indicate that ND860-2 differs from Kennebec and Norchip in that a lower percentage of the total sugar is converted to reducing sugar at either temperature, also ND860-2 never has as high a concentration of total sugar at 38° as do Kennebec and Norchip. The progeny of crosses using ND860-2 as a parent accumulated sugars at a concentration intermediate between the high sugar parent and ND860-2, a low sugar accumulator. Considerable improvement in the storability of the tubers in relation to sugar accumulation can be expected by using ND860-2 as a parent. Indications are that the ratio of reducing to total sugars is a good index for judging whether a potato line or cultivar will chip after storage at 38°F.

Genetic Expression of the Sugary Enhancer (se) Gene in a Starchy (Su) Background.
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The sugary enhancer (se) gene has received much attention as a desirable modifier of the sugary (su) endosperm mutation in sweet corn. When homozygous, se doubles kernel sugar content in su genotypes. The purpose of this research is to identify whether se is expressed in a dominant starchy (Su) background or is strictly a recessive modifier of su. It was determined that the variation which exists in total sugar (TS) levels from kernel to kernel in a Su dent inbred (Oh 43D) and a su se inbred (IL 677a) at the mature dry stage is small enough to allow for selecting kernels containing se in various crosses between the 2 inbreds. Our results suggest that the F1
kernels containing 1 dose of se in the endosperm had a 2.0% TS content in comparison to a 1.4% TS in Oh 43D kernels. A backcross was also analyzed and kernels fell into 2 classes according to TS levels (2.0% and 2.4%). Since Su kernels are segregating for 1 and 3 doses of se in the endosperm, differences in sugar levels suggest that se operates in a dosage-like fashion. The se allele may have practical applications by increasing the sugar levels in Su varieties—an important component in livestock feed and alcohol production.

Effect of Using Ultra Early Tomato Lines as Seed Parents on the Earliness of F₁ Hybrid Lines.
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Nineteen ultra early tomato cultivars and lines were crossed with four late large fruited cultivars and one late small fruited cultivar to produce 92 F₁ hybrid lines. The F₁ hybrid lines plus the parents were field-planted in late May 1986 and observations made on early yield, plant size, crop size, fruit size, fruit soluble solids, and leaf diseases. The data were subjected to statistical analyses. Early yields of the F₁ hybrids ranged from 52% to 307% of the seed parent whereas fruit size was increased by 110% to 318% as compared with the seed parents.

Ten-year Selection and Evaluation Study of Ash (Fraxinus).
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In 1974, seven ash species, including over 60 selections and 25 named cultivars, were planted in a replicated evaluation study in eastern North Dakota. Over 80% of the selections were obtained from visually superior trees of green ash (F. pennsylvanica Marsh.) growing in the Northern Plains. Criteria for selection included the following: dioecious, male trees; freedom from ash flower-gall and other maladies; superior growth habit or branch arrangement and quality of the foliage. Selections were vegetatively propagated by whip grafting. Half of the plants were planted deeply to promote scion rooting and half shallow to avoid scion rooting. Depth of planting (scion rooting) made absolutely no difference in tree growth or performance. Four final green ash selections with superior aesthetic qualities are being increased for introduction and naming. Comparative growth rate and winter hardiness data are presented for superior selections and named cultivars of several species. Non-winter hardy species and cultivars are also compiled.

The Effect of Some Plant Growth Retardants on Some Herbaceous Perennials.
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Several hardy perennials were treated with plant growth retardants to determine their efficacy and the desirability of using retardants to improve saleability of these crops. Achillea, Delphinium, Chrysanthemum (Shasta Daisy), and Aquilegia were beneficially affected by the retardants. Dicentra, Liatris, and Echinaea were not significantly affected by the treatments.

Micropropagation of Selected Acer Sp. and Cultivars.
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The genus Acer, maples, contains many tree species which are important as forestry and landscape plants. Many are propagated as clones. Some clones are grafted; however, the variable nature of seedling rootstocks can cause incompatibility. Cuttings are used with some success. Micropropagation has the potential for more efficient propagation of maples. Our success in using thidiazuron to stimulate shoot tip proliferation in vitro of two clones of Acer x freemani was one of the first reports of success with this important genus. Recently, these studies were extended to include A. rubrum 'Red Sunset', 'Armstrong'; A. saccharum 'Legacy', 'Bonfire', 'Green Mountain'; A. giszeum; and A. miyabei. Dormant shoots, collected in February, were forced in the laboratory before being cultured. Slightly expanded shoots were later collected in early spring and immediately put into culture. Shoot proliferation with A. rubrum was observed on explants after five weeks in culture. A browning response was observed with explants of A. saccharum collected in the spring, but not with those collected in winter. A. giszeum and A. miyabei survived culture initiation, but no shoot proliferation was noted.

Effects of Early Application of Growth Regulators to Pine Seedlings.
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Greenhouse grown seedlings of Pinus sylvestris and Pinus nigra were treated with plant growth regulators in a 1% solution of dimethyl sulfoxide. Benzylamino purine (BAP) induced branching of the seedlings. The addition of gibberellic acid (GA) to the BAP treatments had little effect on branching. Higher concentrations of BAP decreased the caliper of the seedlings 120 days after treatment. The number of apical buds at growth cessation was generally increased by applications of BAP. Alar had no effect on the seedlings whereas seedlings treated with ethephon were shorter 60 days after treatment.

The Effect of Soil and Air Temperatures and Photoperiod on Forcing of Zantedeschia rehmannii and Z. elliotiiiana.

Zantedeschia rehmannii (pink calla lilly) and Z. elliotiiiana (yellow calla lilly) were grown for 90 days at 15° and 20°C air temperature with ambient soil temperature or soil heating to 20° or 25°. Z. rehmannii flowered significantly earlier, was taller, and had more leaves per shoot at higher air and soil temperatures. Number of flowers produced was unchanged. Z. elliotiiiana tended to flower sooner, on taller plants, at higher soil and air temperatures. Both species were also grown for 90 days at 20° under an 8 hour photoperiod (SD) or an 8 hour photoperiod with a 4 hour night interruption (LD). LD plants of both species were significantly taller, but there was no effect on days to flower or number of flowers produced.

Evaluation and Propagation of Shantung Maple as a New Plant Introduction to the Southern Great Plains.
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The Shantung or Purpleblow maple, Acer truncatum Bunge, native to northern China, was introduced by the USDA Regional Plant Introduction Station, Ames, Iowa as PI118578 for testing in regional (NC-7) trials in the north central states. Trees have been hardy at Wichita (zone 6-USDA) and Colby, Kan. (zone 5) although other states reported consider-
The Effect of Varying the Nitrogen to Sulfur Ratio on Poinsettias.
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Poinsettia cuttings 'Dark Red Hegg' were grown hydroponically for 8 weeks. Nutrient levels supplied were combinations of 0, 127, and 254 ppm N, and 0, 32, and 64 ppm S. A 3 x 3 factorial within a 4 x 4 latin square was the experimental design used. Plants were sampled for foliar analysis and visual observations were recorded every 2 weeks. SO2 levels in the greenhouse were monitored weekly and found to be minimal. No visual differences between treatments were seen at the 2 or 4 week sampling dates. Visual differences appeared between 5-6 weeks of growth. Treatments with 0 N and 0, 32, or 64 ppm S had smaller yellow plants with patches of light orange on older leaves of the 0 N and 0 S. Treatments with either 127 or 254 ppm N and 0 S had deficiency symptoms as found in previous research—reddening of main veins and yellowing of upper leaves only. Treatments with 254 ppm N and 32 or 64 ppm S were not as green or lush as treatments at 127 ppm N and 32 or 64 ppm S. Corresponding N levels in plant tissue determined by micro-Kjeldhal and S determined by HNO3 and H2O2 digest for ion chromatography will also be presented.

Optimum Plug Spacing Requirements for Establishment of Buffalograss.
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The establishment of buffalograss [Buchloe dactyloides (Nutt.) Englem.] by seed for turfgrass use has been considered a slow, difficult process. Establishment through vegetative plugs is considered an excellent alternative. Spacing of pre-rooted and non-pre-rooted plugs was evaluated to determine recommendations. Fifty by fifty mm plugs of buffalograss were prerooted eight weeks in the greenhouse in cavity trays and were compared to non-prerooted plugs. The plugs were planted in the field on May 21, 1986, on 15, 30, and 45 cm centers. Stolon counts were taken for the first three weeks and color ratings and percent cover were measured for the entire growing season. The prerooted plugs showed significantly higher percent cover ratings than the non-prerooted plugs. The 15 cm spaced plugs had higher ratings initially, with the other treatments showing equal ratings as the season progressed. There appeared to be some slight interactions between the prerooting and spacing, but further analysis seems to indicate that the differences are attributed to the prerooting.

Evaluation of Time and Storage Conditions on Buffalograss [Buchloe dactyloides (Nutt.) Englem.] Caryopses Germination.
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Buffalograss is a warm-season native grass that has its caryopsis enclosed in a rough burr. With present work being done on the removal of the caryopses from the burr, storage of the caryopses and its viability over time has been a concern for both untreated and KNO3-treated caryopses. Caryopses removed from the burr and burrs containing caryopses were stored at room temperature and in cold storage for three, nine, and 15 month intervals to determine the effects of storage time and conditions. Only after 15 months did the caryopses in cold storage show a slight drop in germination compared to those stored at room temperature. After three months of storage the caryopses showed an overall 96% germination. After nine months of storage the caryopses showed an overall 93% germination. After 15 months of storage the caryopses showed an overall 90% germination. Another test will be evaluated during 1987 and 1988 to test repeatability.

Performance of Potatoes Derived from Unilateral Sexual Polyploidization.

Crosses were made between tetraploid (2n = 4x = 48) potato cultivars and 2n gamete-producing potato haploid-wild Solanum species hybrids (2n = 2x = 24). The products of this unilateral sexual polyploidization breeding schedule were 4x hybrids containing wild species germplasm. These 4x hybrids were evaluated in a yield trial replicated across two locations in North Dakota. Many of the entries were early maturing, unlike their wild species grandparents. In addition, several produced yields similar to check cultivars. High specific gravity, an important factor for processing quality, was common among these 4x x 2x hybrids. Wild species are valuable sources of quality traits, as well as disease resistance, pest resistance, and stress tolerance. The introduction of genetic variability from wild Solanum species contributes to tuber yield in potato by maximizing heterozygosity. The unilateral sexual polyploidization scheme is an effective and efficient method of incorporating diploid wild Solanum species germplasm into the cultivated tetraploid potato.