CHEMICAL MANIPULATION OF WHITE CLOVER (*Trifolium repens* L.) GROWN FOR SEED PRODUCTION

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ABSTRACT

The effects of chemical manipulation through the use of plant growth regulators on white clover (*Trifolium repens* L.) cv. Grasslands Pitau grown for seed were investigated in this study, using both sward and individual plant trials.

A white clover seed crop was established in autumn 1988, certified breeders seed of cv. Grasslands Pitau being sown at 3 kg/ha in 45 cm rows. Three plant growth regulators, chlormequat chloride (1.5 and 3.0 kg a.i./ha), paclobutrazol (0.5 and 1.0 kg a.i./ha) and triapenthenol (0.5 and 1.0 kg a.i./ha) were applied at two growth stages; during reproductive initiation (11 October) or at the appearance of the first visible bud (8 November). A further plant growth regulator, daminozide (2.0 and 4.0 kg a.i./ha) was applied only in November. Chlormequat chloride, daminozide and triapenthenol did not significantly affect node production, inflorescence production or seed yield, although thousand seed weight (TSW) was reduced. Paclobutrazol significantly reduced petiole length and increased the number of nodes/m^2, but did not affect dry matter production. The October application of paclobutrazol at 1.0 kg a.i./ha significantly increased potential harvestable seed yield by 71 % through increasing the number of inflorescences produced, but the 57 % increase following the November application at the same rate did not differ significantly from the control. Actual seed yield differences (+25 and 26 %) were also not significant.

In the following season (1989/1990), three of the plant growth regulators (chlormequat chloride at 3.0 kg a.i./ha, paclobutrazol at 1.0 kg a.i./ha, triapenthenol at 1.0 kg a.i./ha) were applied using the same site as for the 1988/1989 trial (i.e. a second year crop), but avoiding plots previously sprayed with paclobutrazol to eliminate possible soil residual effects. Applications were either during early reproductive initiation (September), during peak reproductive initiation (October) or when reproductive buds/early flowers were first visible (November). Chlormequat chloride did not affect either vegetative or reproductive growth and development. Triapenthenol initially retarded growth (e.g. by reducing petiole length), but this effect was only transiatory, and was no longer evident 3 weeks after application. Although triapenthenol applied in November increased inflorescence number at peak flowering, seed yield was not increased. Triapenthenol applied in October did not affect inflorescence number at peak flowering, but reduced TSW. Paclobutrazol applied in September, October and November reduced petiole length and leaf size,

but only application in November increased both node and stolon production. Application in October and November increased inflorescence numbers at peak flowering and harvest respectively, but seed yield was not increased. Data recorded from plots sprayed with paclobutrazol the previous season (1988/1989) provided no evidence of growth retardation through soil residual activity.

In an attempt to clarify the effects of paclobutrazol on white clover growth and development, individual plants grown from seeds selected at random from a lot of certified breeders seed were established as spaced plants (80 x 80 cm) in the field in spring of 1990. Paclobutrazol was applied at 1.0 kg a.i./ha on 6 November 1990 (when more than 75 % of the plants were initiating reproductive buds at their terminal buds) or 23 November 1990 (when more than 50 % of the plant population had reproductive buds visible on their stolons). Petiole length and leaf size were initially reduced, but beginning two months after application, vigorous regrowth occurred, to the extent that paclobutrazol treated plants became as tall as the control plants. However, retardation effects occurred again at harvest. Total plant dry matter and root:shoot ratios were not affected by paclobutrazol. Chlorophyll content/unit leaf area and leaf thickness increased following paclobutrazol application, but increases were not correlated. Seed yield and yield components did not differ from that of the control plants, mainly because plant to plant variation was very large, irrespective of treatment.

To attempt to reduce this source of variation, a further spaced plant trial was established in 1991/1992 using plants produced by clonal propagation from three distinct genotypes from within cv. Grasslands Pitau. Paclobutrazol was applied at the same rate and time as in the previous season, and while not affecting the number of nodes developed along stolons or inflorescence initiation at the stolon apices, it did significantly increase stolon production in all three genotypes through increasing secondary, tertiary and to a lesser extent quaternary branch numbers. However, not all these extra stolons were able to produce inflorescences, and this ability varied significantly with genotype. As a consequence, inflorescence number and potential harvestable seed yield were significantly increased only in one genotype following paclobutrazol application. However, paclobutrazol reduced seed abortion and increased seed weight in all three genotypes.

In individual plants, inflorescence growth and development from emergence to the seed ripening stage occurred more quickly in paclobutrazol treated plants than untreated plants. A simulated sward trial was used in 1990/1991 to determine whether the previous failures to significantly increase actual seed yield were because paclobutrazol treated plots had ripened earlier than control plots, and as a consequence more seed had been shed by the time of harvest. However, no significant paclobutrazolXharvest time interactions for seed yield or seed yield components were recorded. These results suggest that paclobutrazol did not affect seed maturity in a sward situation. Irrespective of treatment, greatest seed yield came from harvesting 25 days after peak flowering, but this did not differ significantly from harvesting 35 days after peak flowering. Delaying harvest to 40 and 45 days after peak flowering significantly reduced seed yield. As in previous sward trials, paclobutrazol application significantly increased inflorescence numbers, but large (+56 %) differences in potential harvestable and actual seed yield were statistically not significant. In each case, high data variation (CV > 30 %) was recorded. Factors responsible for the failure of apparent biological increases to be statistically real are briefly discussed.

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