

Weed Management in Organic Oats.

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OBJECTIVES

- To compare the effectiveness of oat cultivar competitiveness, seeding rate, and seeding method, on weed control and grain and straw yield of organic oats.
- To assess the robustness of management practices over years and sites. (PLATE 1)

MATERIALS AND METHODS

- Cultivars were chosen for a range in expected competitiveness with weeds, with IDA least competitive, AC Stewart and AC Rigodon intermediate, and OAC Paisley most competitive.
- Four plant population densities, 150, 250, 350, and 450 seeds m^{-2} (adjusted for germinability) were compared. Recommended level is 250 pl m^{-2} .
- Each density was sown by two methods - broadcast and drilled - to reflect actual on-farm practice.
- The 4 x 4 x 2 treatments were sown in an RCB design with 4 replications at the Ignatius Jesuit Center, near Guelph, in 2002 and 2003. The two trials differed greatly in weather and background weediness, producing an ideal opportunity to look for interactions among management and climatic factors. The 2002 results reflected a late, wet spring, delayed seeding, and a site heavily infested with mustard. Trial results from 2003 reflected a late spring but otherwise excellent growing conditions, timely planting, and few, mostly grassy, weeds. Unless otherwise noted, results are reported as the mean of 2002 and 2003.

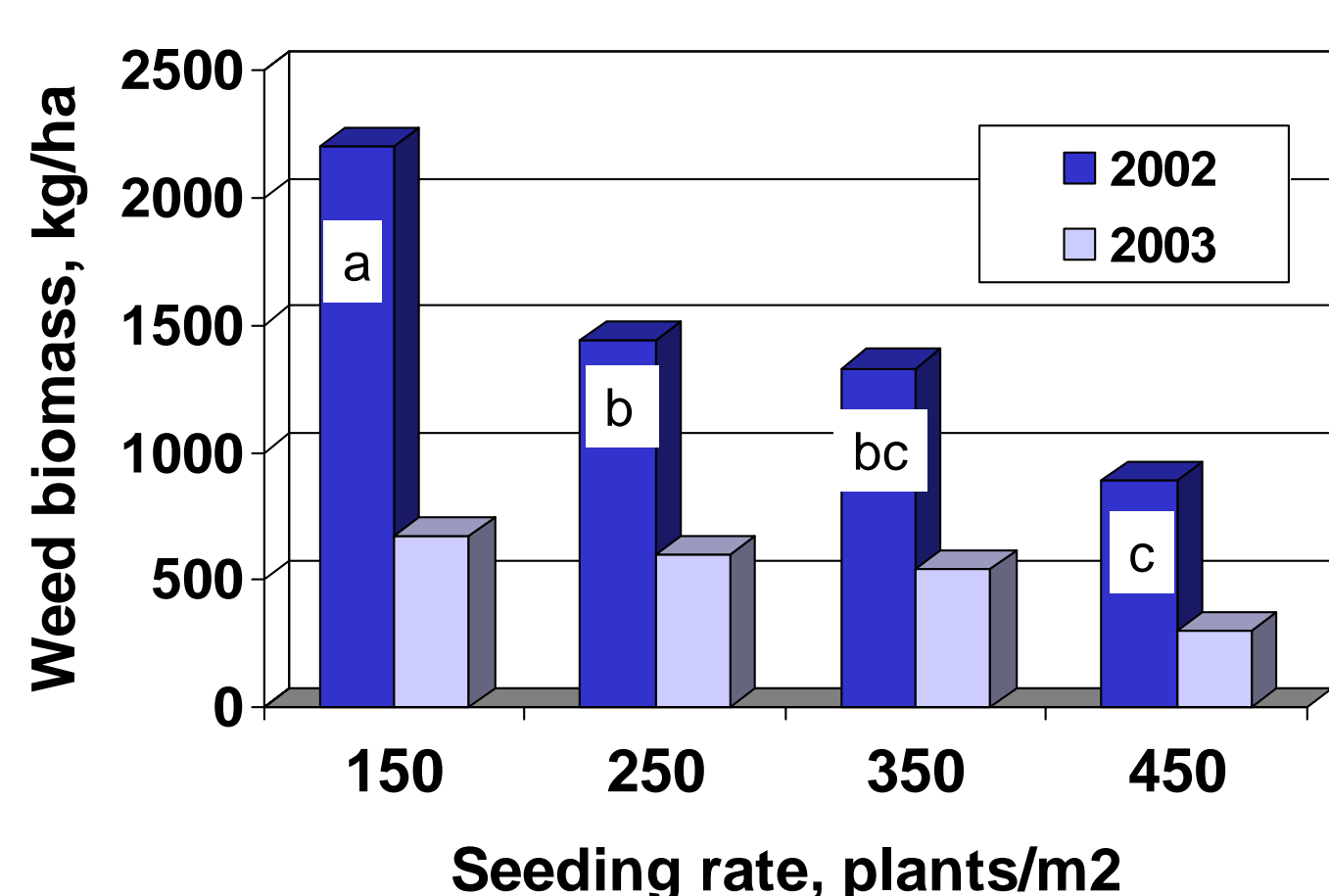
RESULTS AND DISCUSSION

Weed Management

Weed biomass at grain harvest was nearly three times higher in 2002 than in 2003 (*), reflecting both site differences in background weediness and the greater competitiveness of oats in the good growing conditions of 2003 (Fig 1).

Cultivars had no effect on weediness at grain harvest in either year or over years (Fig 1). Seeding rate reduced weed biomass at grain harvest in 2002 but not in 2003, reflecting the importance of background weediness (Fig. 2). In both years, incrementally increasing seeding rate substantially reduced weed biomass in a stepwise fashion. Drilling (in rows) also reduced weed biomass, again, only when weeds were prominent (Fig. 3).

Fig 2. Does weed biomass at harvest respond to seeding rate?



Grain and Straw Yield.

- Grain yield was 60% higher in 2003 than in 2002, averaging 3590 vs. 2210 kg ha^{-1} , respectively. (PLATE 2)
- Ida (highest) outyielded AC Rigadon (lowest) by 36 (***) and 22% (**), respectively, or 28% on average, with rank order unchanged by growing conditions or weediness (Fig 4).
- Straw yield was unaffected by cultivar, but was 65% higher (***) in 2003 than in 2002 (4310 vs. 2610 kg m^{-2} , resp.).

Fig 1. Do cultivars affect weed biomass at harvest?

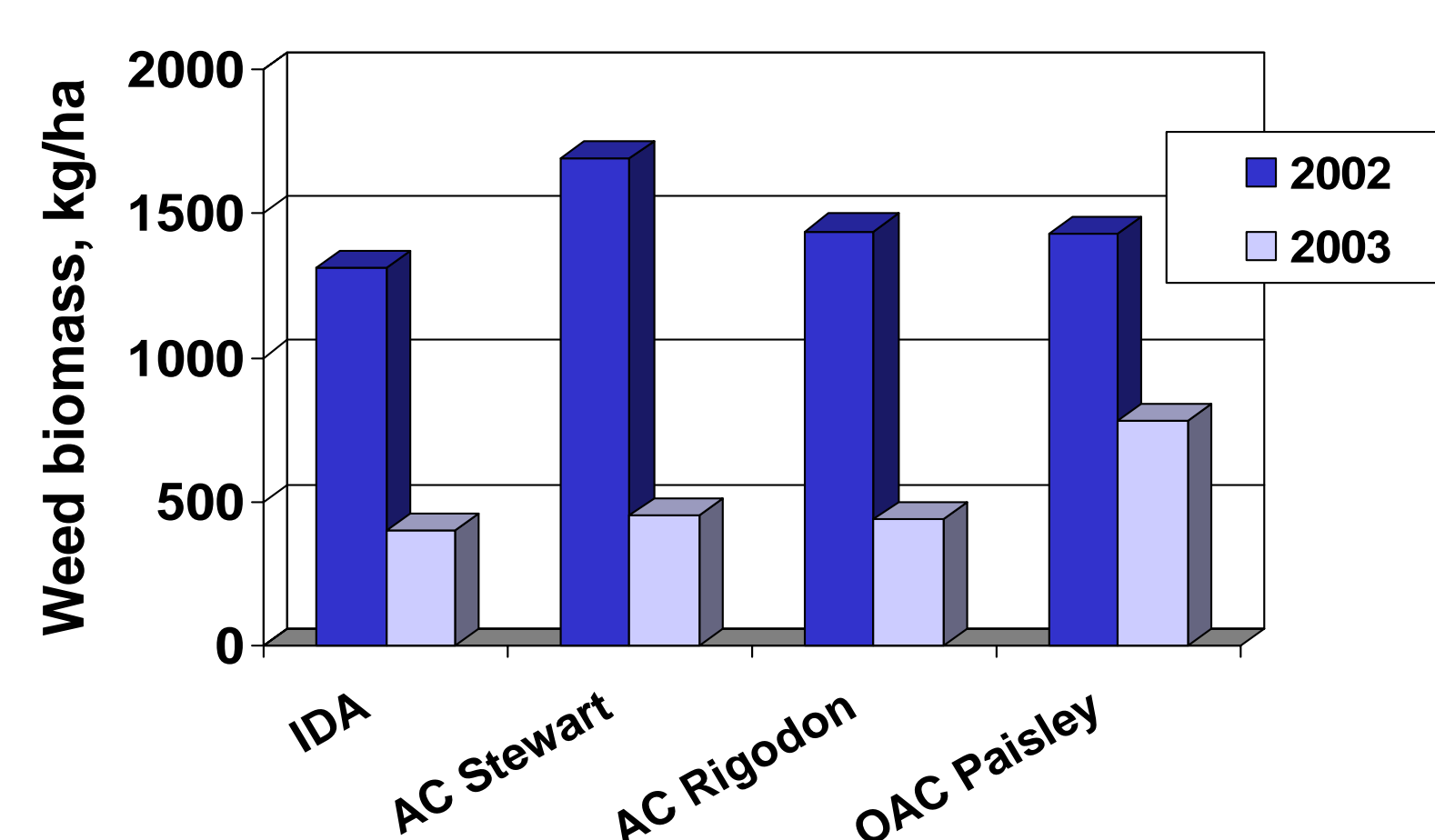


Fig 3. Does weed biomass at harvest vary with seeding method?

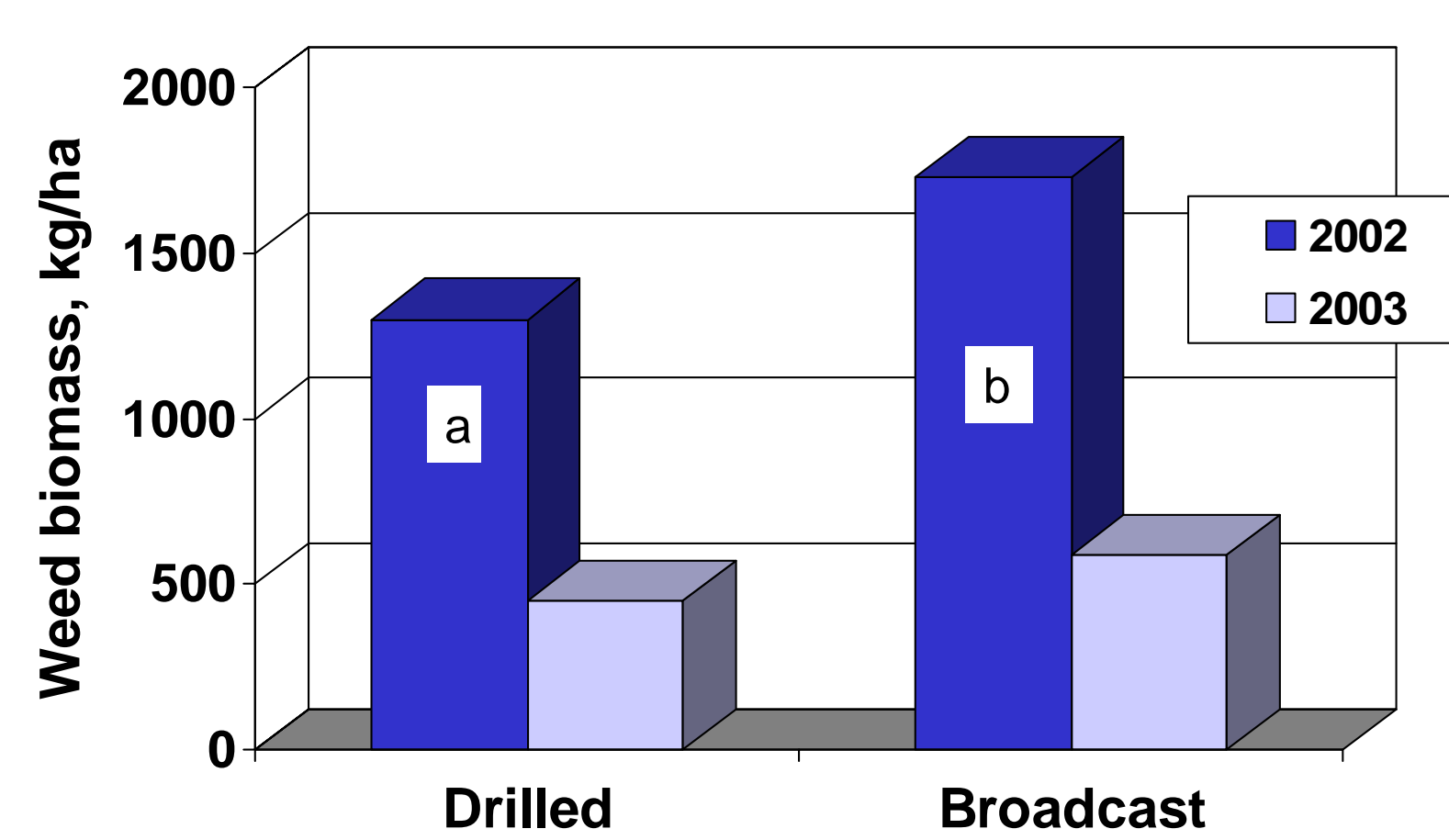
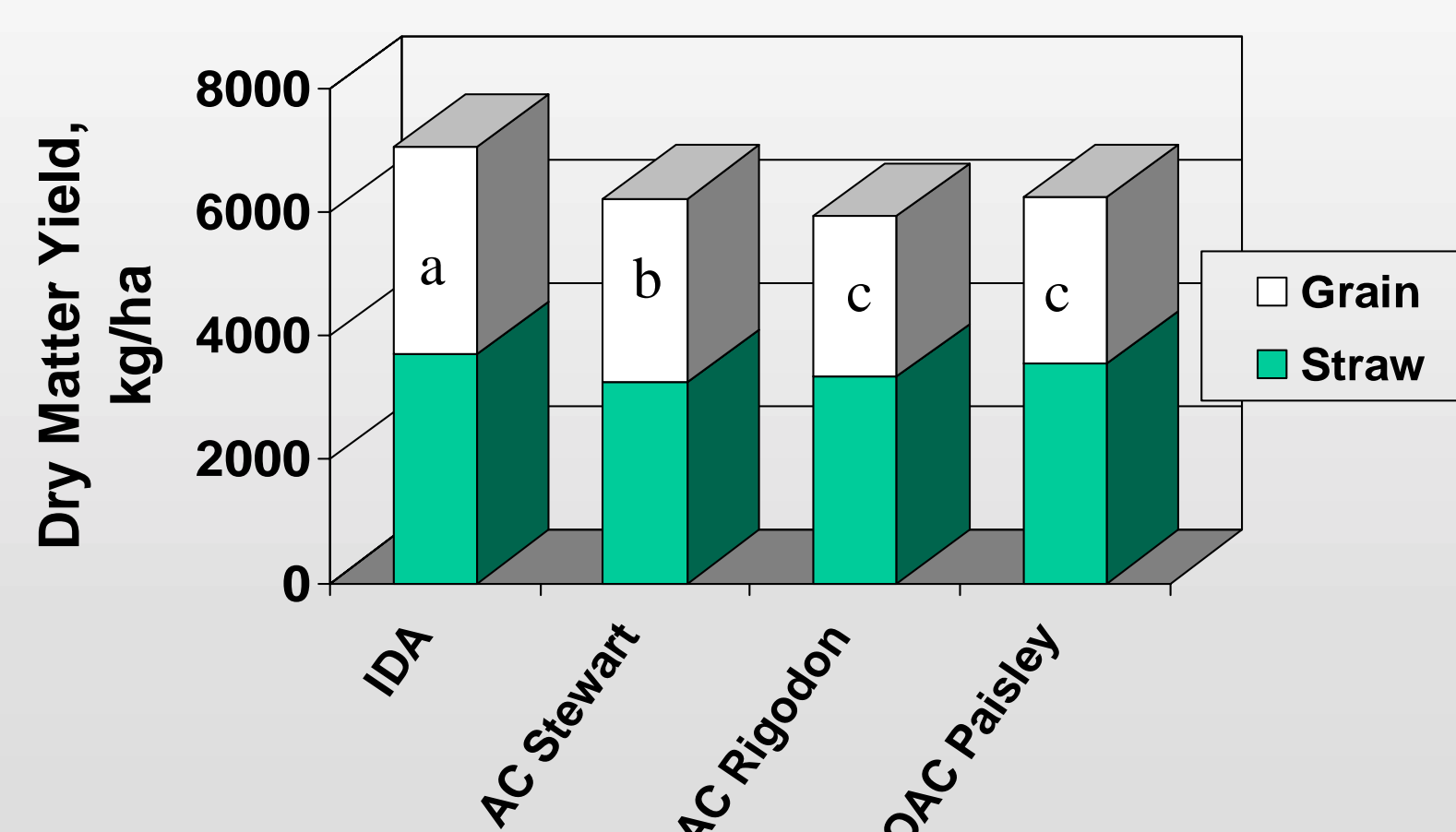


Fig 4. Do cultivars differ in grain and straw yield?



RESULTS AND DISCUSSION (CONT)

- On average, grain yield increased by 19% over the full range of seeding rates (Fig 5), but significantly so only in 2002. The improved conditions of 2003 reduced the beneficial effect of seeding rate on grain yield.
- Straw yield responded positively to seeding rate in both years, with 450 plants m^{-2} yielding 28% more than 150 plants m^{-2} .
- Drilling significantly increased grain yield in both years, by an average of 11% (Fig 6), but did not affect HI. Thus, the greatest benefit from drilling over broadcasting was in significantly reducing weed biomass (850 vs. 1210 kg m^{-2} , resp) (Fig 3).
- Drilling also significantly increased straw yield in both years, by 15% on average.

Fig 5. Does seeding rate influence grain and straw yield?

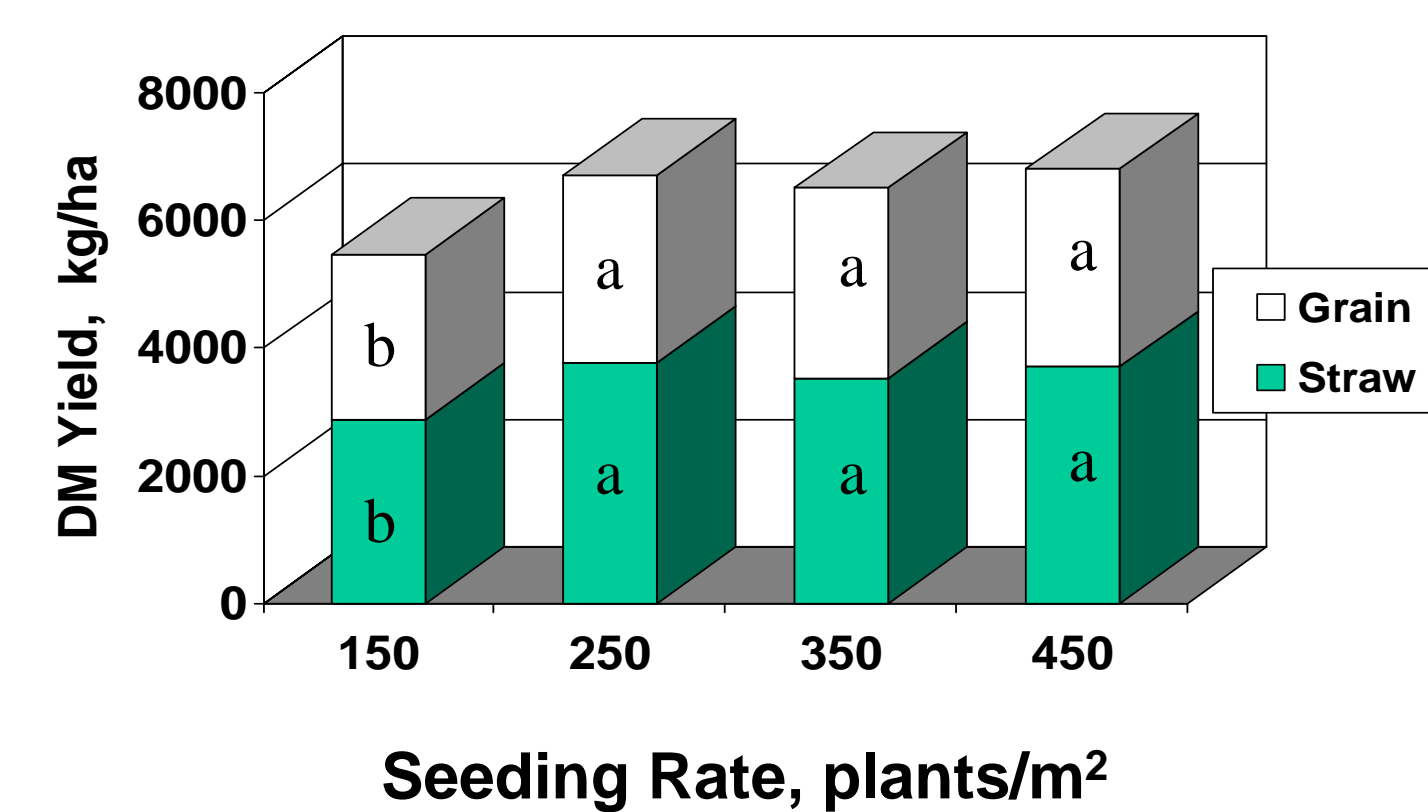


Fig 6. Do grain and straw yield respond to method of seeding?

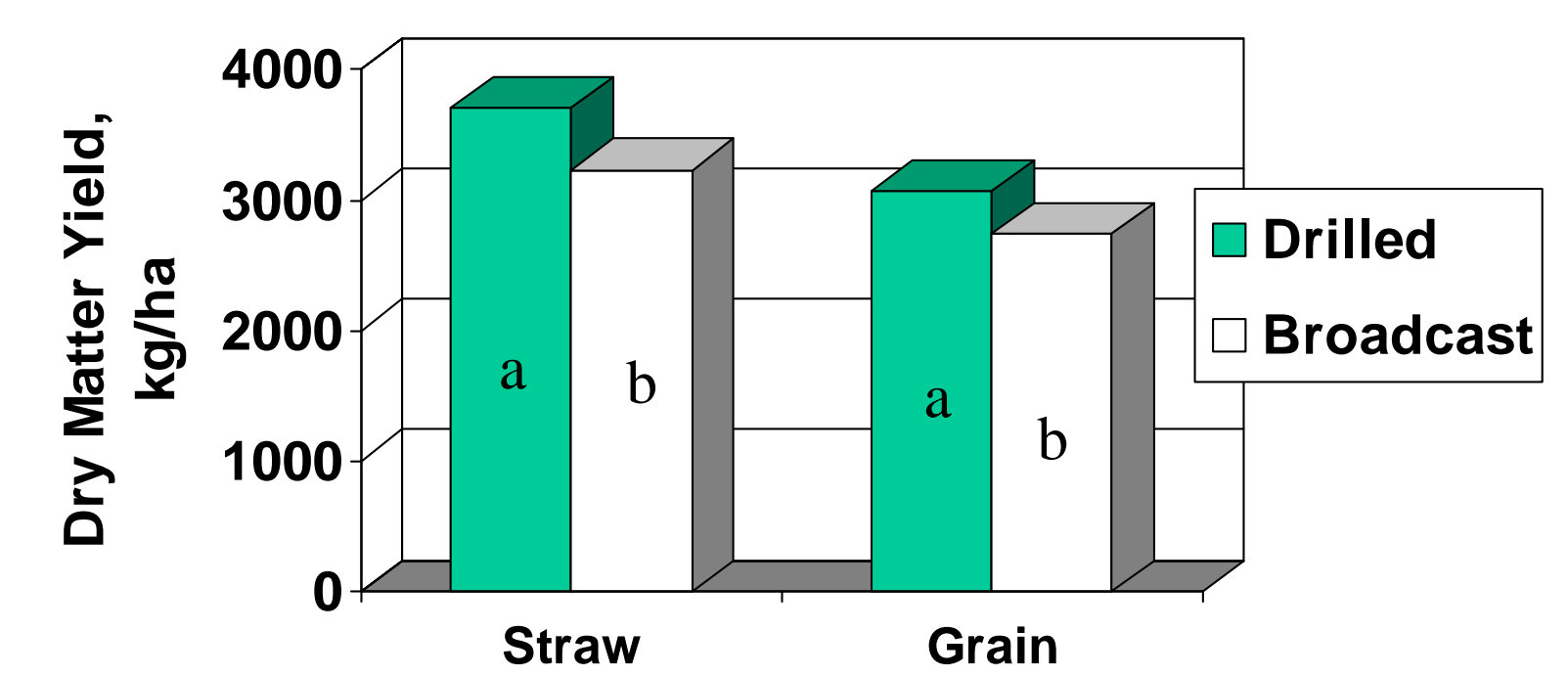


PLATE 1 Drilled treatment at 350 seeds/m²



PLATE 2 Oats at Harvest



CONCLUSIONS

- Year/site significantly affected weed biomass as well as grain and straw yield, but did not interact with cultivar, seeding rate, or planting method. Thus, response to management was robust over widely differing growing conditions.
- Weed biomass was low and unresponsive to management when growing conditions were good for oats. Drilling and increasing seeding rate may be most beneficial in suppressing weeds when growing conditions are poor for oats.
- Of the three management variables, mean grain yield ranged by 28% among cultivars, 19% among seeding rates, and 11% between seeding methods. Thus, cultivar selection exerted a stronger influence on grain yield than either seeding rate or seeding method.
- However, effects were additive, as the best vs. worst combinations of cultivar, seeding rate, and method produced ranges of 51 and 89% in grain yield in 2002 and 2003, resp. Thus, attention to all three variables is likely to produce the greatest weed suppression and highest grain and straw yields. (PLATE 3)

PLATE 3 Field and personnel at midseason



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