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EFFECTS OF WATER STRESS AT
DIFFERENT STAGES OF GROWTH
ON SEED YIELD OF SAFFLOWER

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ABSTRACT

Safflower plants were grown from seed in controlled environment rooms. The light and dark period temperatures were 23°C and 18°C respectively. Plant water deficits of -8 to -10 bar were imposed for 20 days during each of the periods floral initiation, inflorescence development, flowering, the post flowering period, and for 12 days during secondary head flowering. Water stress during floral initiation or inflorescence development significantly reduced yield over water stress at any other stage of growth. Seed yield was reduced 46% and 57% by water stress during floral initiation and inflorescence development respectively, compared with well watered plants.

Of the sequentially developing traits of seed yield, number of seeds per head accounted for most variation in seed yield, followed by number of heads per plant. Seed weight had relatively little effect on variation in seed yield.

Water stress at floral initiation reduced seed yield due to a 32% reduction in head number per plant at final harvest. Fewer florets developed in each head, contributing to a 53% reduction in the potential seed number per plant. Water stress during inflorescence development reduced the number of heads per plant by 30% and the number of seeds per head by 34%. Water stress during the flowering period reduced seed weight by 23%. This was attributed to a 38% reduction in seed hull weight. Water stress after flowering reduced seed hull content by up to 15% and was associated with a higher seed oil content of 26.5% compared with 22.3% for well watered plants.

It was concluded that safflower should be planted early to minimise the risk of water stress during inflorescence development, and that seed quality may be improved by dry conditions after flowering. From the results it was suggested that safflower may not necessarily be dependant on an extensive root system for its independence of late season rainfall.

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INTRODUCTION

Safflower (Carthamus Tinctorius L) is an oilseed crop traditionally adapted to fairly low altitude, semi-arid regions. Introductions to America from the old centres of culture were initially grown in California and Mexico where they were best adapted. Successful development was attributable largely to the efforts of plant breeders through increased seed oil content and resistance to disease. Success from improvements of this nature may have been to the detriment of production research, since poor adaptation of varieties to the environment continues to limit seed yields in new areas of production (Cutting 1974). Better information is needed about how safflower responds under environmental stress in order to improve production practices and increase seed yields.

Crop yield has been limited by lack of water in most areas, although safflower is particularly responsive to irrigation. Much of the information relating to drought effects on safflower has in general, been of limited value as it has been almost entirely location and season specific. This experiment was designed to quantitatively determine the effects of water stress on seed yield of safflower under controlled environmental conditions.