COMPARATIVE WATER USE BY SIX DRYLAND ALTERNATIVE CROPS

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Many growers in the low-precipitation (less than 12 inch annual) non-irrigated crop production region of the inland Pacific Northwest (PNW), want to diversify the wheat (*Triticum aestivum* L.) monoculture cropping system with alternative crops. In such dry environments the quantity of water used by alternative crops, and the soil depths from which water is extracted, is an important factor determining water availability for subsequent crops. A 2-year field study was conducted at 3 sites (5 site years) to determine water use and above-ground dry matter production (DMP) characteristics of six spring-planted alternative crops that may have agronomic and economic potential. Crops were dry field pea (*Pisum sativum* L.), flax (*Linum usitatissimum* L.), yellow mustard (*Brassica hirta*), foxtail millet (*Setaria italica* L.), safflower (*Carthamus tinctorius* L.), and sunflower (*Helianthus annuus* L.). Soil water content to a depth of six feet and DMP were measured at approximate 20-day intervals during the growing season. Crops fell into four water-use categories, from greatest to lowest: i) sunflower, safflower, millet, ii) yellow mustard, iii) flax, and iv) pea. Soil water use (minus precipitation) ranged from 4.8 inches for sunflower to 1.7 inches for pea. Each crop showed a unique extent and soil depth from where water was extracted. Average total DMP ranged from 8,125 lbs/acre for sunflower to 4,195 lbs/acre for pea. This is the first published report on comparative water use of alternative crops in the PNW dryland cropping region.

SEED PRIMING WINTER WHEAT FOR GERMINATION, EMERGENCE AND YIELD

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Insufficient stand establishment of winter wheat (*Triticum aestivum* L.) is a major problem in the low-precipitation (less than 12 inch annual) dryland summer fallow region of the inland Pacific Northwest. Low seed zone water potential, deep planting depths with six inches or more soil covering the seed, and soil crusting caused by rain before seedling emergence frequently impede winter wheat stands. A 2-year study involving laboratory, greenhouse, and field components was conducted to determine seed priming effects on winter wheat germination, emergence, and grain yield. Two varieties were used based on their strong (Edwin) and moderate (Madsen) emergence capabilities. Germination rate was measured in the laboratory using 44 treatment combinations (2 varieties x 3 priming durations x 7 priming media + 2 checks). Germination rate differed between varieties as well as by priming duration, priming media, and concentration of priming media. The most promising laboratory treatments were advanced to greenhouse and field experiments where emergence and grain yield (field only) were measured in 10 treatments (2 varieties x 4 priming media + 2 checks) from wheat planted deep with six inches of soil covering the seed. In the greenhouse, seed primed in potassium chloride (KCl), polyethylene glycol (PEG), and water led to enhanced emergence of Madsen, but not of Edwin, compared to checks. Rate and extent of seedling emergence was greater for Edwin compared to Madsen irrespective of priming media in three of four field plantings at Lind, Washington. None of the seed priming media benefited field emergence or subsequent grain yield in either variety compared to checks. Overall, results suggest that seed priming has limited practical application for enhancing emergence and yield of winter wheat planted deep into summer fallow.

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