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***Triticum aestivum* Yield and Water-use Efficiency in the Draâ Oases at South East Morocco: Irrigation and N-fertiliser Effects**

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Abstract

More erratic and decreasing rainfall in the Mansour Eddhabi Dam catchment had severe impacts on irrigated agriculture in the downstream Draâ Oases. Among other practices, N-fertiliser quantity and source and timing of irrigation are possible mitigation measures to increase grain yield and water-use efficiency (WUE) of *Triticum aestivum* (cv. Achtar). Field experiments were conducted during 2009–2010 at two oases (Mezguita and Ktoua). The experiments were laid out as split-split plot design: main plot was irrigation (farmer's practice or scheduled at sowing, beginning of tillering, beginning of elongation, beginning of ear formation and end of flowering), subplot was N-fertiliser (urea or FYM) and sub-subplot was N-fertiliser quantity (0, 50 or 100 kg N ha⁻¹). At Ktoua, only two fertiliser rates could be tested (0 and 100 kg N ha⁻¹). Another experiment was carried out at Ouarzazate, upstream of the Draâ, to identify the grain yield for the area under “unstressed” conditions. There was no significant difference between the proposed stages irrigation and farmer's irrigation at both sites. Average grain yields were 2.0 and 3.2 Mg ha⁻¹ and WUE were 2.7 and 5.7 kg mm⁻¹ in Mezguita and Ktoua respectively. N-fertiliser quantity and source had significant effect on grain yield and WUE in Ktoua. Control treatment yielded 2.3 Mg ha⁻¹ grain and 3.9 kg mm⁻¹ WUE. Application of 100 kg N ha⁻¹ as FYM led to an increase of 60 % grain yield and 66 % WUE. Urea 100 kg N ha⁻¹ doubled both grain yield and WUE. At Mezguita, the effect of N-fertiliser was less pronounced. Application of 100 kg N ha⁻¹ as urea increased the yield by 50 % and WUE by 77 % over control (1.9 Mg ha⁻¹ and WUE of 2.6 kg mm⁻¹). FYM at a rate of 100 kg N ha⁻¹ yielded a slightly significant increase. The intermediate 50 kg N ha⁻¹ of either N-fertilisers showed no advantage over control. The highest yield attained at Ktoua of 4.6 Mg ha⁻¹ is still only 60 % of the 7.8 Mg ha⁻¹ unstressed grain yield obtained at Ouarzazate. N-fertiliser as urea appears to have a great potential in the area, especially in the poorer oasis of Ktoua, where most farmers seldom use fertilisers. Wheat-phases irrigation might be advantageous over usual farmers' practices in dry years.

Keywords: Achtar, grain yield, Ktoua, Mezguita, Ouarzazate, winter wheat