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ASSESSMENT OF FERTILIZER USE EFFICIENCY AND COST ECONOMICS WITH SUBSURFACE FERTIGATION IN WHEAT CROP

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Abstract

This study evaluated the effects of subsurface nitrogen fertilization on wheat yield and nutrient uptake under varying irrigation and fertigation levels using a split-plot design. The experiment included four irrigation levels I_1 (100% Et_c), I_2 (80% Et_c), I_3 (60% Et_c) at sub-surface and I_4 (80% Et_c) at surface level and four fertigation treatments F_1 (100% RDF), F_2 (80% RDF), F_3 (60% RDF), and F_4 (no fertigation). Yield attributes such as plant height, tiller count, 1000-grain weight, and grain and straw yields were assessed. Plant height and tiller count showed no significant differences between irrigation at I_1 and I_2 level of irrigation, also at fertigation at F_1 and F_2 levels of fertigation**,** indicating the potential for reducing water and fertilizer use without compromising growth. Phosphorus content in grain was observed to be twice that in straw, while potassium concentration in straw was 2.5 times higher than in grain. Nitrogen use efficiency (NUE) varied, with recovery efficiency ranging between 37% and 53% for grain and agronomic efficiency reaching up to 30 kg/kg under optimal irrigation and fertigation levels (I_2 and F_2). Cost analysis revealed production costs ranging from $348 to $418, with the highest return observed under optimized irrigation and fertigation (I_2F_2) treatment with B:C ratio of 3.19. The findings highlight the potential of 80% ET_c irrigation and 80% RDF fertigation to achieve a 20% reduction in water and nitrogen fertilizer use while maintaining yields, offering a sustainable solution for wheat production in water-scarce regions.

Keywords: B:C ratio, N-fertigation, nitrogen use efficiency, subsurface drip irrigation, wheat productivity

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