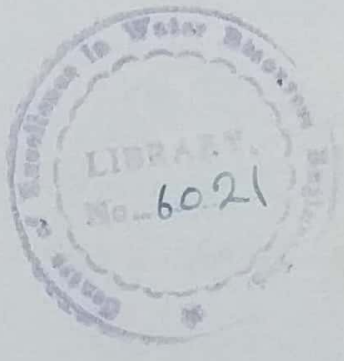
THESIS

NITRATE MOVEMENT AND SHALLOW GROUNDWATER CONTAMINATION IN LYSIMETERS



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ABSTRACT

NITRATE MOVEMENT AND SHALLOW GROUNDWATER CONTAMINATION IN LYSIMATERS

Nitrate pollution from agro-chemicals applications in irrigated areas is a ubiquitous issue all over the world. Several studies indicate that a large percentage of applied fertilizer moves into the groundwater reservoir through leaching process. The nitrate present in groundwater creates health complications especially in infants. The greatest risk is likely to be in rural agricultural areas of developing countries, where fertilizer applications are progressively increasing and the rural people without any treatment use groundwater.

The present study was planned to investigate leaching pattern of NO_3-N under controlled conditions in lysimeters. The main objectives of this study were to determine the effect of different fertilizer doses and application treatments on crop yield and monitor nutrient movement below root zone. In addition to this, applicability of model LEACHMN for the assessment of NO_3-N leaching behavior was also studied using field data.

The results of the study revealed that split fertilizer application helps in improving the management of nitrogenous fertilizer and retains major portion of applied fertilizer in the root zone for longer period of time, which increases the crop yield. Low yields were observed under heavy fertilizer doses. Heavy fertilizer application causes nutrient imbalance in soil profile, which reduces the crop yield. In Rabi season, extremely low evaporation rates, long irrigation intervals and low precipitation cause sluggish movement of water in soil profile that keeps most of the applied fertilizer in the upper soil profile and reduces the hazard of nitrate leaching. But in Khraif season significant leaching of nitrate was observed in the lower soil layers. This situation demands the careful management of fertilizer application

in Kharif season. Application of LEACHMN model shows over estimation of plant nitrogen uptake. The model simulation resulted in insignificant effect of fertilizer doses and treatment on nitrogen leaching. The results indicates that the performance of the model in predicting NO_3-N management can be improved by improving the water flow component and early plant nitrogen uptake processes.

As the study was conducted under controlled environment, therefore the results of present study must carefully be utilized while dealing with field situations different than the evaluated ones. However, the guidelines deduced from this study will become increasingly more valuable for the managers, end users and planners.