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Effective radius of corrugated drainage pipes wrapped with a thin geotextile envelope

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Subsurface drainage is widely used in farmland. Entrance resistance occurs when water flows into a perforated drain pipe, reducing the drainage efficiency and resulting in a high water table. Using the real radius will overestimate the drainage discharge. Accurately calculating effective radius is essential for subsurface drainage calculation and simulation. New effective radius formulas for corrugated drains wrapped with a thin geotextile were proposed by dividing the entrance resistance into corrugation and perforation resistance. The accuracy of the formulas was verified by sand tank experiments. Sensitivity analysis was conducted to determine the factors that affected effective radius, indicating that corrugation was the main factor. When the radius and structure of the drain wall were determined, the opening area exhibited high sensitivity with interactivity between it and drainage discharge. The effect of the opening area and position of the perforations on the effective radius was evaluated for different drainage discharges. Putting the perforations on the bottom was better for drainage efficiency. For small drainage discharge of less than 0.1 $cm^3\ s^{-1}\ cm^{-1}$, the opening area was not significant, and an opening area of 15 $cm^2\ m^{-1}$ was sufficient. However, for greater drainage discharge, an opening area of 60 $cm^2\ m^{-1}$ with three or more row perforations would be required.