

Ph.D Thesis

**PROSPECTS AND HYDRAULICS OF FILM-HOLE IRRIGATION
IN IRRIGATED ENVIRONMENT**



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ABSTRACT

Water is one of the most precious commodities for human sustenance. With the rapid rise of our country's population, importance of safe and fresh water resources has increased manifold. Changes in climatic pattern and accelerated rate of glacial melt are making the availability of fresh water scarce and insecure day by day. Due to water scarcity, it is call of the day that more crops must be grown with less water. Keeping in view the importance of irrigation water a new technique was tested on experimental basis which is known as Film-Hole Irrigation (FHI). Film-hole irrigation refers to the application of water to bordered field completely covered with plastic sheet having holes of equal sizes through which seedlings come out. Film-hole irrigation is reported to be relatively efficient irrigation technique compared to the others by Chinese's researchers. Field experiments were conducted to check the effectiveness and performance of Film-hole irrigation in terms of water advance, water saving with various lengths and widths of borders during border and bed-furrows field layouts under sunflower and wheat crops. These field experiments were conducted at Postgraduate Agriculture Research Station (PARS), Faisalabad. Three different experiments were conducted like sunflower on borders, wheat on borders and wheat crop on bed-furrows, three separate sites were selected at Postgraduate Agricultural Research Centre, University of Agriculture, Faisalabad during October, 2009 and November, 2011. Four different plot sizes 48mx5m, 48mx3m, 24mx5m and 24mx3m for sunflower and three type plots like 72mx3m, 48mx3m and 24mx3m for wheat on borders experiments were used. In the same three type plots like 72mx0.60m, 48mx0.60m and 24mx0.60m for bed-furrow experiment were used. Three replications of each experiment were carried out. The soil of the experimental site was fine sandy loam. Tubewell irrigation water and canal water were applied with

an average discharge of 21 l/s and 19 l/s for sunflower and wheat crop, respectively. Sunflower crop was grown on borders while wheat crop was grown on borders as well as on bed-furrows. The field data was collected from each plot during 1st, 2nd and 3rd irrigations. Results of the study revealed that advance time taken during Film-hole irrigation in completing the advance phase was comparatively less as compared with the conventional irrigation. Infiltration rate was less with Film-hole plots as compared with conventional plots. The evaporation was only 8% with covered Pan of Film-hole as compared with open pan. Water savings of 37 to 45%, 9 to 23% and 41 to 45% were observed by Film-hole irrigation on borders of sunflower crop, borders of wheat crop and bed-furrows of wheat crop, respectively. Crop yield was higher as compared with conventional irrigation i.e. 23 to 45%, 23 to 30% and 24 to 33% of sunflower crop irrigated borders, wheat irrigated borders and wheat grown on bed-furrows, respectively.

During economics analysis it was observed that when the film hole method was compared with conventional method, its net benefit cost ratio is 1:64. ANOVA (Analysis of Variance) software was applied to the data of water saving and crop yield of three experiments (i. Sunflower, ii. Wheat (Borders), iii. Wheat on Bed-Furrows). It was observed that during the analysis all data of water saving and crops yield is significant and values which are different with each other are not significant.

It is recommended that Film-hole technique should be adopted for borders as well as for Bed-Furrows for reducing advance time of water front and water saving. Weeds in the crop field could be depressed by using the Film-hole technique in the field.

Key words: Film-hole, borders, water advance, water saving, conventional, crop yield.