Internat. J. Agric. Sci. Vol.3 No.2 June, 2007 : 22-25

Development of rainfall intensity nomograph for Dapoli of Konkan region of Maharashtra, India

M. S. MANE, B. L. AYARE, D. S. KUBAL, A. B. SAVANE AND H. K. PATIL*
Department of Agrl. Economics, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, DAPOLI (M.S.) INDIA

ABSTRACT

The rainfall charts of 14 years of Dapoli were analysed in the form of annual maximum series of various duration, viz. 5, 10, 15, 30 minutes and 1, 3, 6, 12 and 24 hours. The rainfall intensity-duration-return period relationship as $I = KT^{a}/(t+b)^{d}$ has been developed for Dapoli, Konkan region under sub-humid high rainfall zone of Maharashtra. The values of parameters a and b were determined by using graphical method and the values of K and d by least square method in the rainfall intensity-duration-return period relation. The values of constants K, a, b and d were found to be 11.08, 0.1892, 1.01, 1.2066 respectively. The nomograph was developed for Dapoli station from intensity-frequency-duration relationship. The per cent deviation in rainfall intensity values observed from mathematical and nomographic solution ranged from (–) 8.3 to 14.2 per cent, which lies with in the acceptable limit. The developed nomograph can be used for computation of rainfall intensity for different duration upto 24 hours for 100 years at Dapoli.

Key words : Nomograph, Intensity-duration-return period relation, Rainfall intensity.

INTRODUCTION

Rainfall intensity is the important parameter need to be determined properly to be used in rational formula. Rational formula, because of its simplicity is being used extensively for estimating peak runoff rate from small drainage areas. In U.S.A. the generalized charts of rainfall intensity-duration-return period developed earlier by Yarnell (1935) and later revised by U.S. Weather Bureau (1961) are being used for obtaining the values of 'I', the rainfall intensity in the rational formula (Ram Babu *et al*. 1979).

Rainfall intensity-duration-return period equation on regional basis can provide solution for computation of rainfall intensity required in estimation of peak flow, which is necessary for design of soil conservation and runoff disposal structures and for planning flood control project (Barai *et al*. 2005). In order to simplify the procedure and to facilitate the computation for field workers the nomograph can prove to be a better option.

MATERIALS AND METHODS

Various equations, that were found to represent the rainfall intensity-duration-return period relationship in India and abroad, were summarized and discussed by Raghunath *et al.* (1969). However the most satisfactory general equation is,

$$I = \frac{KT^{a}}{(t+b)^{d}} \quad \text{---------- (1)}$$

Where,

I	= rainfall intensity, cm hr^{-1}
T	= return period, year
T	= duration, hr
K, b	= derived constants
a, d	= derived exponents

The altitude of raingauge station located at Wakawali Tal- Dapoli is 167-234 m above MSL. The longitude and latitude are $73^{0}16'$ to $73^{0}19'$ E and $17^{0}19'$ to $17^{0}40'$ N, respectively. Climatically the area falls under sub-humid zone. The annual average rainfall is 3525.05 mm. In the present study the rainfall charts of 14 years from 1988 to 2001 of meteorology observatory of the Irrigation Scheme, situated at Central Experiment Station, Wakawali, Tal:Dapoli., were obtained. The rainfall charts were analysed in the form of annual maximum series for various durations viz. 5, 10, 15, 30 minutes and 1, 3, 6, 12 and 24 hours. The maximum depth of rainfall for various durations was worked out employing 'Original trace method' suggested by Ogrosky and Mockus (1957) for all duration (Table 1). Using the rainfall intensities obtained for three different per cent chances, the return period lines were developed and rainfall intensities for 1 per cent (100 years), 2, 4, 10, 25 and 50 per cent (2 years) were obtained (Table 2) and can be considered as observed values of rainfall intensities. The rainfall intensity-duration-return period equation was developed using the following steps (Ram

* Author for correspondence.