

VISUAL QUANTIFICATION STUDIES ON *CYMBOPOGON JWARANCUSA* (JONES) SCHULT. AT LEAF DEVELOPMENT UNDER ARID CLIMATE

A. K. SHAHI AND D. N. SEN

Ecology Laboratory, Botany Department, University of Jodhpur, Jodhpur-342 001

Cymbopogon jwarancusa (Jones) Schult. is a scented, essential oil yielding perennial grass of Thar desert distributed in various parts of western Rajasthan. It is also a fodder grass but considered inferior due to the presence of characteristic odour. The fresh green leaves are the economic source of essential oil. The appearance of successive leaves on the plant and their relationship to climate factors, mainly ambient temperature as degree days and bright sunshine durations (h) are some of the meaningful parameters for the study of temperature and role of leaf appearance under fluctuating climatic conditions. The interacting climatic effects on *C. jwarancusa* are indicators of its acclimatization and large ecological amplitude under arid conditions. The variation in the rate of leaf appearance in thermal time (ambient temperature accumulated above a fixed base of 5°C) was better correlated with the rate at which the bright sunshine hours were changing at each development stage of the wheat plants (Nuttonson, 1955; Chakravarty and Sastry, 1983).

Keeping the above facts in view, an experiment was conducted at the Botanical Garden of the University of Jodhpur, Jodhpur (Rajasthan), to find out the impact of these environmental variables on the appearance of successive leaves in *C. jwarancusa* under arid climatic conditions.

The fresh tussocks of *C. jwarancusa* grass were collected from Bikaner and nearby places and planted in earthen pots on 6 July, 1987. Three replications were used for the observations. The plants were irrigated when needed and leaf appearance was noted. The duration of leaf appearance was arbitrarily defined as the time when it was greater than 10 cm long. The data were examined using linear regression, partial and simple correlation coefficients analysis. The essential oil content was determined by using Clevenger apparatus.

The leaf appearance stage was linearly related to accumulated temperature, i. e. degree days. The correlation coefficient (r) between leaf appearance stage and degree days was (positive) linearly significant ($r = 0.95$) and the bright sunshine hours had negative ($r = 0.72$) value (Table 1). The rate of leaf appearance was 0.003364 leaves degree day⁻¹. These relationships were upgraded to partial correlation coefficient and coefficient of determination ($R = r^2 \times 100$) for understanding the possible variability.

The studies revealed that 96% (positive) and 65% (negative) variability was caused by degree days and bright sunshine hours on leaf appearance stage.

Table 1. Correlation coefficient (r) among leaf appearance stage, degree days and bright sunshine hours on *C. jwarancusa*

Leafing (X ₁)	Degree days (Physiological age) (X ₂)	Bright sunshine hours (X ₃)	Correlation coefficient (r)	
			r ₁₂	r ₁₃
4	665.50	9.70	0.95	-0.72
5	826.85	6.80		
6	1388.25	7.84		
7	1625.55	8.44		
9	1818.49	5.40		

The leaf length in relation to calendar days exhibited that the older leaves on the clumps increased in length upto 42 days then yellowing of leaves had taken place. The development and elongation of other leaves on clumps were continued upto 50 days. From the practical utility point of view, the green leaves should be harvested at 6-7 leafing stage, before their yellowing, for the maximum oil recovery, which corresponds 40 to 50 days from the date of planting of tussocks under irrigated conditions during rainy season. Each leaf lives for only a restricted period. It is also to be mentioned that the leaf at a particular node elongates for a limited number of days as presented in Table 2. However, this basic pattern varies with species and environment.

Table 2. Observations on elongation of leaf in *C. jwarancusa*

Age of plant (days)	No. of leaves	Elongation (cm) of the leaf number								
		1	2	3	4	5	6	7	8	9
20	4	13.50	12.30	11.50	11.00	—	—	—	—	—
25	5	13.80	14.56	19.83	17.00	11.33	—	—	—	—
42	6	20.36	23.00	25.33	30.36	22.00	8.43	—	—	—
49	7	(14.33)	28.00	25.00	34.83	41.50	32.66	15.33	—	—
56	9	—	(25.00)	32.00	(33.50)	37.50	34.00	27.00	18.00	9.55

Values in parentheses indicate green part of leaf length

The authors are thankful to Prof. N. Sankhla, the Convenor, UGC(DRS) for providing necessary facilities. Financial assistance from UGC is gratefully acknowledged.

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