viability in storage with germination of 80% and above, while UGM 24 recorded only 18% germination. The percentage germination ranged from 30 to 78 in other genotypes. Burgess (1938) in soybean, observed significant differences among varieties, for viability and vigour in storage. Large size seeds (76%) recorded significantly higher germination percentage than the medium (65%) and small size seeds (50%). The association between seed size and storability of seeds has been well documented by Verma and Gupta (1975) in soybean and according to Ovcharov (1969), large and small seed differed in their germination capacity after storage.

The root and shoot length measurements and dry matter production of seedlings from eight months old seed exhibited significant variations among genotypes and size grades (Tables 1, 2). Among the genotypes, UGM 35 recorded the maximum lengths of root and shoot and dry matter production of seedlings after eight months of storage while UGM 24 recorded the minimum. Seed vigour has been defined as the inherent ability of the seed to produce a vigourous seedlings (Hydecker, 1972). The root and shoot length and dry matter production of seedlings were higher in large seeds than in medium and smaller seeds. From the results of the present study, it is suggested that the genotypic configuration and the seed size differences cause variations in seed viability and vigour during storage.

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RUN OFF PARAMETERS - A COMPARATIVE STUDY OF TWO RIVER BASINS

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ABSTRACT

The morphological and climatic factors affecting runoff were studied using correlation and regression methods during 1989-'90. Two river basins of Kerala viz. west flowing Chaliyar and east flowing Kabbani were selected for the analysis. They were divided into sub-basins, each containing a river gauge station. Drainage area length and order of the main stream, maximum straight length of the sub-basin and rainfall were the chief factors influencing streamflow. Non-monsoon discharge was only a small fraction of the total discharge. Major portion of the monthly streamflow was from monsoon rainfall of the same month.

Rivers have a significant role in the geomorphological processes in human use. If the morphological balance of the river basin is disturbed the distributaries of all orders are affected, which, in turn affects the run off. A comparative study of the climatic and morphological parameters of Chaliyar and Kabbani river basins was conducted at Kelappaji College of Agricultural Engineering and Technology, Tavanur during 1989-'90. The data were analysed at the

Table 1. Order, area, maximum straight length and discharge of the sub-basins

River basin	No.	Sub-basin	Order	Area (km^2)	Maximum straight length of sub basin (km)	Average monthly monsoon discharge (Mm^3)	
						1976-'80	1981-'85
	1	Kanhirapuzha	3	68	18.80	38.22	30.87
	2	Kuthirapuzpha	3	284	27.60	122.00	119.78
	3	Mukkon	3	221	29.60	205.01	161.45
	4	Maruthapuzha	3	144	20.40	42.47	26.94
Chaliyar	5	Chaliyar	4	386.69	42.40	198.89	109.98
	6	Koodathni	4	103	20.00	124.85	60.71
	7	Punnapuzha	4	344	40.80	104.28	87.78
	8	Arecode	5	1841	76.00	589.64	532.48
	9	Karimpuzha	5	670.35	45.20	235.83	203.98
	1	Manjot	2	47.50	-	7.73	5.42
	2	Vazhavatta	2	57.50	10.80	17.26	7.50
	3	Kakkavayal	3	90	21.20	16.25	28.05
	4	Muthanga	3	192	18.40	35.26	35.94
Kabbani	5	Thirunelli	3	38	14.00	36.31	22.66
	6	Thondar	3	30	18.80	24.77	17.96
	7	Baveli	4	190	36.80	44.94	34.52
	8	Choorani	4	35	15.60	56.50	25.07
	9	Manantodddy	5	398	38.80	221.02	60.03
	10	Panamaram	5	460	42.00	14.87	12.96

computer centre, Kerala Agricultural University, Vellanikkara.

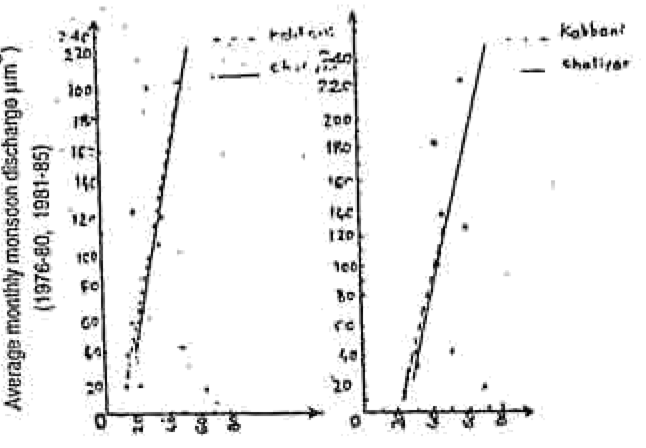
The Chaliyar river is very rich in hydro-electric potential since some of the main tributaries originate from a height of about 2500 m above M.S.L and rapidly fall in height during their flow. The ayacut area in the river basin can be increased by 40 per cent using proper irrigation schemes. Kabbani river is one of the important tributaries of Cauvery river. The river takes its origin from the Western Ghats at very high altitudes. Most favourable conditions exist in this river for the construction of storage reservoirs and for the generation of electricity. Single crop cultivation is practised in most of the lands in the river basin. It is possible to convert a considerable portion of the lands into double or triple crop lands by supplying irrigation water at the proper seasons. Detailed investigations are now being made in the two river basins for tapping the water resources effectively.

Shallash and Starmans (1969) developed a formula for annual runoff using drainage density and total annual rainfall. Milhouse (1976) opined that geomorphic parameters are acceptable for estimating flood flows but not advisable for estimating low flows. Chinnamani and Sakthivadivel (1980) found that the maximum flood flow had an upward trend from 1966 - '67 when the topography was changed by the complete obliteration of soil conservation works.

MATERIALS AND METHODS

Two river basins of Kerala were selected for the study. Chaliyar is west flowing to the Arabian sea and Kabbani, a tributary of Cauvery, is east flowing to the Bay of Bengal. The hydrological data of 1976 - '85 were collected for the analysis. The period was split into 1976 - '80 and 1981 - '85 to make up for the effect of drought in 1983.

The river basin was divided into sub-basins so that the water of each sub-basin drains to the river gauge station at the end of the sub-basin. Accordingly, the number of sub-basins were 9 and 10 in Chaliyar and Kabbani basins respectively. River gauge readings were collected at 8 A.M., 12 noon and 4 P.M. Discharge was found from a standardised curve of gauge reading (m) and discharge (m^3/s). Weighted daily, monthly and annual discharges were then computed. The system of classification of river network put forward by Horton (1932) and Strahler (1964) was adopted for each sub-basin. The morphological factors



Maximum Straight length of sub-basin (cm)

collected were (i) order of the stream (ii) confluence ratio (iii) drainage area (iv) maximum straight length of the sub-basin and (v) length of main stream. Confluence ratio was calculated using the equation $R_c = N_u/N_{u+1}$ where, R_c is confluence ratio. N_u is the number of streams of order u and N_{u+1} is the number of streams of order u+1, using the method of weighted means. Maximum straight length was measured as the distance between the farthest points on the perimeter of the sub-basin. Length of main stream was measured from the starting of the river to the river gauge along with path having maximum deviation. Rainfall data were collected from all the rain gauge stations within the limits of the sub-basin. Arithmetic average of the rainfall on monthly and annual basis was calculated for the analysis. All the quantitative parameters were studied with reference to the monthly discharge, annual discharge and the discharge contributed by unit area of the sub-basin. The relationship of rainfall and streamflow was studied using linear and exponantial models. However, linear models were used for the final analysis, as the other forms were found less suitable.

RESULTS AND DISCUSSION

Confluence ratio had an inverse relationship with the annual monsoon discharge per unit area of the sub-basins of Chaliyar (r = -0.73* when 1976 - '85 was considered and r = -0.78* when 1976 - '80 and 1981 - '85 were considered). But the relationship was not significant for Kabbani basin. For a given order, the peak discharge was lower for a higher confluence ratio in both river basins. Discharge was influenced by drainage area as well as the order of the main stream. The relationship of drainage area with the annual discharge of 1976 - '80 and 1981 - '85 was examined (r = 0.96** and 0.97** for Chaliyar and 0.49* and 0.45* for Kabbani during 1976 - '80 and 1981 - '85 respectively). The flood discharge per unit area was inversely proportional to size because the more intense storms are usually of the smaller size. The discharge contributed by unit area was clearly, due to rainfall (r = 0.87* for Chaliyar during the two periods). An increase in the discharge per unit area with the increase of rainfall was noted for the three sub-basins, Manantoddy, Choorani and Thirunelli of Kabbani river basin, in which the correlation and regression studies were not possible due to lack of data. Maximum straight length of sub-basin (Lm) had a direct relationship with the average monthly monsoon discharge (r= 0.93** and 0.44** for Chaliyar and Kabbani during the two periods). Fig.1 explains the relationship between average monthly monsoon discharge and the maximum straight length of the sub-basin. since, the discharge increased with the order, which in turn increased the length of the sub-basin the relationship between discharge and the sub-basin length is quite agreeable. The proportional increase in the average monthly monsoon discharge with respect to the maximum straight length of the sub-basin of Kabbani is noted in Table 1.

It was found that rainfall of the same month contributed about 80- 90 per cent of the monthly discharge in monsoon. The correlation co-efficients between monthly monsoon discharge and monthly rainfall decreased gradually for earlier months. The major portion of the runoff was contributed by monsoon rainfall of that year than by the previous year. Non-monsoon discharge was only a negligible fraction of the total discharge in both river basins.

The morphological factors effecting runoff were order of the stream, length of main stream, maximum straigth length of the sub- basin and drainage area. The climatic factor (rainfall) together with the effect of these factors explained the runoff from the sub- basins. The extent of relationship of these factors with riverflow varied for both the river basins but the nature remained the same. All of these factors were inter-related and related to drainage area. Hence, drainage area and rainfall can be considered as the most powerful factors influencing discharge. Benson (1962) developed an equation for the peak discharge for 164 basins of New England in terms of drainage area and annual rainfall. Average monthly monsoon discharge and rainfall were significant for the Chaliyar and Kabbani river basins and the discharge had high correlations with the rainfall and drainage area. The variations in runoff with rainfall and watershed characteristics were emphasized earlier but the extent of relationship between streamflow and the morphological parameters in the present study were different, due to the change in topography of the river basins.

The streamflow is a function of the morphological and climatic factors. The most powerful factors are the drainage area and the monsoon rainfall. The peak flow is lower for a higher confluence ratio. Monthly monsoon discharge is more influenced by the rainfall of the same month. Non-monsoon discharge formed a very small fraction of the total discharge. Alterations in the runoff parameters by natural reasons or human interention affect the streamflow.

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GERMPLASM SCREENING AGAINST SESAME LEAF ROLLER AND POD BORER

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ABSTRACT

Twenty promising less susceptible sesame entires and one wild species were screened against sesame leaf roller and pod borer in *in vivo* and *in vitro* conditions and compared with five local varieties. Under *in vivo* condition 12 entries *viz.*, SI 1004, SI1029, SI 3315/11, SI 3315/6, SI 53, SI882, 020-1, 59-1-1, PDK31, SI889, SI 990 and SI 964 were moderately resistant. However, only seven entries *viz.*, SI3315/11, SI 53, SI 882, 59-1-1, PDK 31, SI 889 and SSI 990 were identified as moderately resistant under *in vitro* condition. The wild species, *Sesamum alatum* and two entries viz., ES 22 and SI 250 were highly resistant and resistant to this pest respectively under both conditions.

Sesame leaf roller and pod borer *Antigastra catalaunalis* Duphonchel (Pyraustidae : Lepido ptera) is considered to be the most destructive pest and has been causing considerable damage to the crop (Abraham *et al* ., 1977.) This pest during its larval stage damages the leaves, buds, flowers and pods till harvest of the crop (Mahadevan and Mohanasundram, 1986).

Murali Baskaran *et al* ., (1989) screened 1200 sesame entries against leaf roller under field condition and reported 16 entries as field resistant. In the present investigations, 20 promising, less susceptiable sesame entries reported earlier by Mahadevan (1988), one wild species, *Sesamum alatum* and five local varieties were screened in *in vivo* and *in vitro* conditions.