effect, there was reduction in stem thickness. Narrow stem is, however, a desirable character for forage quality and thus of advantage particularly to grazing type of plants where number of tillers are more important than plant height. Negative correlation between leaves/tiller and tillers/m was attributed to adaptive compensation. The correlations were further partitioned into direct and indirect effects to establish the cause and effect relationship among yield and its component characters. The data (Tables 2, 3) revealed that PH, tillers/m and leaves/tiller had positive direct effect on GFY as well as DMY in the first cut while in the second cut, only PH had strong direct effect on GFY as well as DMY. This indicated that with the improvement in PH, there would be simultaneous improvement in leaf and culm characters. Direct effect of plant height on fodder yield was also reported by Dhumale and Mishra (1979).

Indirect effects of PH through CG and leaves/tiller on GFY were positive in the second cut. Similarly in the first cut, the indirect effect of PH CG on fodder yield through leaves/tiller while of the latter through LLWR were positive but negligible. Contribution of leaves to fodder yield has already been reported in many crops. In DMY, PH and tillers/m had direct effect in the first cut while in the second cut, only the days to 50 per cent floom had direct effect on DMY. Therefore, PH, CG, leaves/tiller and LLWR were the most important characters influencing the fodder yield. Thus, selection of genotypes based on these characters are likely to bring improvement in fodder production in multicut oats.

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SOIL FERTILITY STATUS OF KANJAMALAI HILLS, TAMILNADU

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ABSTRACT

Evaluation of nutrient status of Kanjamalai hills of Tamil Nadu reveals that the soils are neutral in reaction, 69 per cent low in N, 100 per cetn low in P and 58 per cent low in K. But the soils are well supplied with Cu, Mn and Fe. The physical properties of the soil is optimum for crop production.

KEY WORDS : Soil fertility, Kanjamalai hills

Salem district spreads ot 8640 sq.km. area/in which Kanjamalai hill is situated 16 km away from Salem town. Kanjamalai form a compact block of hills with steps and slopes lies between 11°30' to 12°0' N and 78°30' E with altitudinal variations from 350 m to 986 m. The Kanjamalai hill range is a bare rocky mountaneous area wiht potentials of medicinal herbs and plants. The atmospheric temperature varies from 21° to 30° C at foot hill to 15° to 25° C at the top. The annual rainfall ranges from 750 and 1200 mm received in different parts of hill and got benefitted from both north east and south west monsoons. The mountaneous range covering an extent of nearly 20 sq.km. is known more appropriately for its sotres of magnetite iron. The iron beds of Kanjamalai are seen in a concentric ellipses forming part of a great synclinal fold. Adequate information on the fertility status of

soils in Kanjamalai hill is not available. Hence the present study was undertaken to evaluate the nutrient status of the soils in Kanjamalai.

MATERIALS AND METHODS

Kanjamalai hill range is highly undulating (Fig.1). Cultivated area is distributed in patches after afforestation (Alagesaboopathy, 1994)

The soils are deep to very deep and noncalcareous. The soils are developed from weathered gneiss. The colour of the surface soil range from reddish brown (5 YR 4/4) to dark yellowish brown (10 YR 3/4). The texture varies from loam to clay loam. These are extensively drained externally with moderate permeability. A profile studied in Kanjamalai hill reserve forest is described below. (Sankararaj *et al.*, 1983; Stalin *et al.*, 1991).

Horizon	Depth (cm)	Description
A2	0-18	Dark brown (7.5 YR 3/2D) dark reddish brown (5 YR 3/3 M). gravelly clay loam weak medium subangular blocky; slightly plastic (wet); many medium roots slow permeability; clear smooth boundary.
B1	19-58	Reddishbrown (5 YR 4/4 D) dark reddish brown (5 YR 3/4 M) gravelly clay loam. Massive braks to break

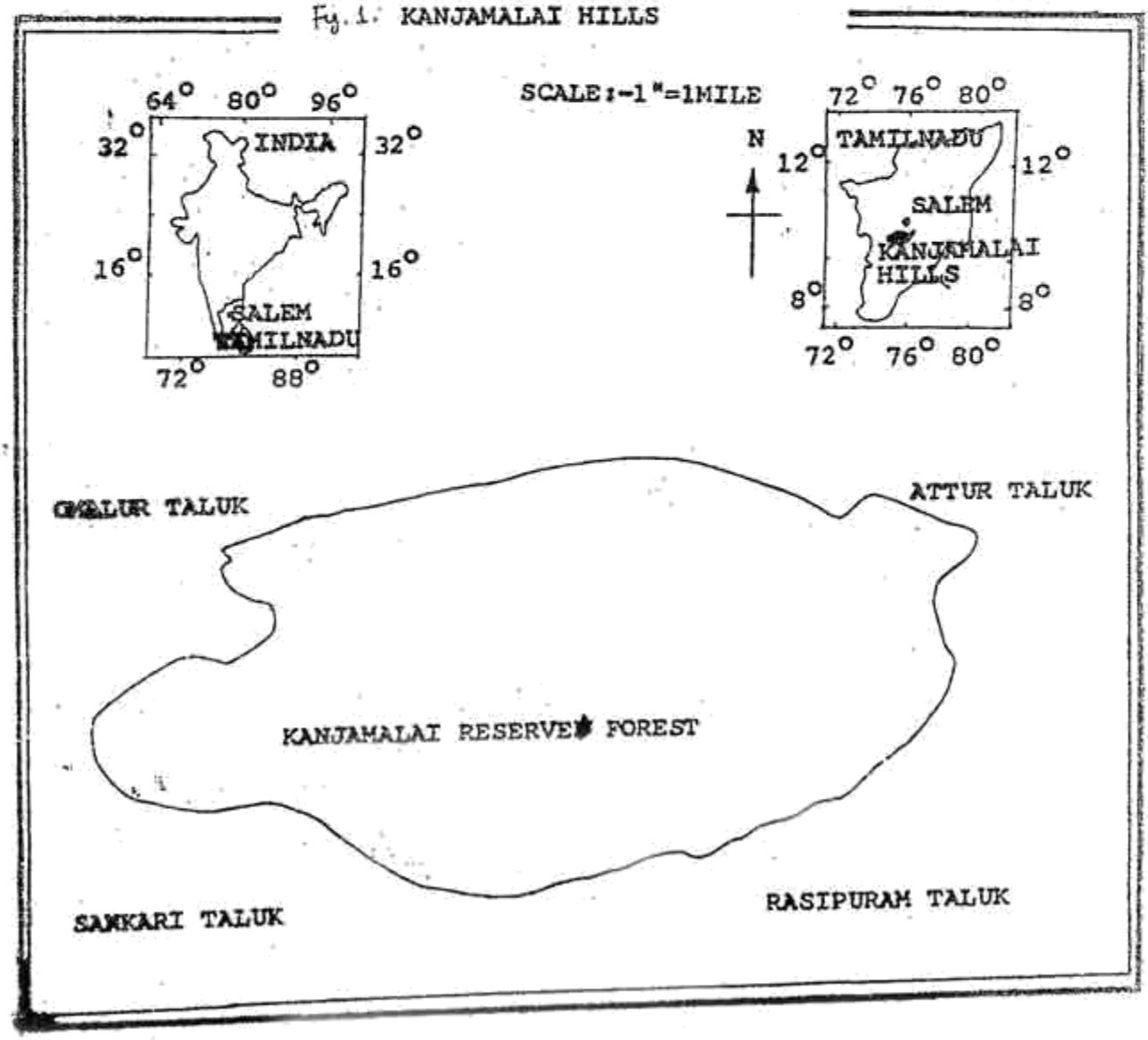

Fig.1. Kanjamalai Hills

medium subangular blocky loose (dry) medium roots; many micropores; slow permeability diffused smooth boundary (pH : 6.4).

B12 58-107 Dark brown (5 YR 4/4 D) darkbrown (7.5 YR 3/2 M) gravelly clay loam; weak medium sub angular blocky; slightly hard (dry) friable (moist) slightly sticky and slightly plastic (wed); few very fine roots; slow permeability abrupt smooth boundary 9pH : 6.2).

B3 107-165 Dark red (2.5 YR 3/6 D and M); clay; weak medium subangular blocky; hard (dry) friable (moist) sticky and plastic (wet); moderately slow permeability (pH : 6.0).

The soils of Kanjamalai hills at the summit are reddishbrown to dark red, deep to very deep find loamy noncalcareous, welldrained with many ferro manganese concretions and many quartzy grades in subsurface and subject to moderate to deep erosion. Soils of the slopes are reddishbrown to dark red shallow to moderately deep, fine loamy, noncalcareous, excessively drained and subjected to severe erosion and run off. In the valley bottom areas of Omalur, Attur, Sankari and Rasipuram taluk villages respectively the soils are red to dark reddish brown very deep: fine loamy; noncalcareous; moderately well drained and subjected to soil depositions. The soils are colluvial and lack uniform horizon differentiation in the areas.

A total of 242 surface soil samples (0-25 cm depth) were collected from randomly selected locations distributed throughout the soil region which are under cultivation. Each soil samples were collected at random. The soils were air dried, pulvarised, screened through 2 mm nylon sieve and taken for analysis. The soils were tested for their soil reaction at 1 : 2.5 suspension, available N, available P, available potassium, organic carbon, cation exchange capacity and exchangeable cations mainly calcium, magnesium, sodium and potassium by following routine methods in the Regional Laboratory, Horticultural Research Station, Yercaud. Besides, available micronutrient cations were extracted with DTPA $CaCl_2$ solution adopting normal procedure. The quantity of micronutrients (Cu, Zn, Mn and Fe) in clear extracts were determined with the help of the automic absorption spectrophotometer.

Soils with pH values 6.0 to 8.0 were grouped as neutral and above 8.0 was grouped as slightly

Table 1. Chemical Properties of Kanjamalai hills soils (Mean value)

Site details	pH	Electrical conductivity (dSm^{-1})	Available N	Available P_2O_5	Available K_2O	Organic carbon (%)	Cation Exch. capacity (cmol kg^{-1})	Exchangeable cations (Cmol kg^{-1})			
			(----------kg/ha----------)					Calcium	Magnesium	Potassium	Sodium
650m East side	6.8	0.086	280	4.0	70	1.38	25.7	14.0	4.0	6.0	1.32
700m East side	6.8	0.052	392	3.0	120	2.08	22.3	8.0	16.0	6.8	0.88
450m West side	7.0	0.050	112	3.0	60	0.88	25.4	8.0	8.0	8.4	0.88
650m West side	7.1	0.053	224	3.0	50	0.83	23.9	10.0	4.0	8.4	0.88
400m South side	7.2	0.061	308	2.0	170	0.95	26.7	11.0	2.0	12.0	1.10
550m South side	8.0	0.090	364	3.0	30	1.10	28.9	11.0	8.0	8.2	0.88
450m North side	8.3	0.092	280	3.0	35	1.40	25.9	13.0	3.0	7.2	2.20
550m North side	7.0	0.050	252	2.0	160	1.25	22.9	6.0	7.0	8.2	1.32
750m North side	6.7	0.072	308	3.0	135	1.28	25.7	9.0	9.5	6.0	0.77
800m North side	6.8	0.058	336	3.0	100	2.08	26.4	9.0	11.0	5.4	0.66
930m North side	7.0	0.072	294	3.0	100	2.18	24.9	8.0	8.5	7.2	0.88
975m North side	7.0	0.062	322	4.0	180	1.53	26.1	9.5	8.5	6.8	0.88
Siddarkoil plain 440m	7.3	0.044	308	3.0	20	0.85	23.4	10.0	6.0	6.0	1.10
Plain lands	7.2	0.057	252	6.0	80	1.07	29.4	13.0	6.0	8.4	1.54

Table 1-a. Available N, P and K status of Kanjamalai hill soils

Particulars	N	Available nutrients P_2O_5	K_2O
Range (kg/ha)	112-364	2.0-6.0	20-180
Mean (kg/ha)	241	4.6	109
Standard deviation	52.7	3.9	41.2
Coefficient of variation	17	3.4	11
Rating :			
Low	69	100	58
Medium	31	-	42
Nutrient Index (Mean data)	-	1.08	1.58

alkaline. For available N, P and K respectively were classified as low, 280-450, 11-22 and the soils with less than 280. 11 and 118 kg/ha 118-280 kg/ha respectively as medium. To calculate the nutrient index for P and K, the percentage of low, medium and high values on an average were multiplied by 1 and 2 respectively, added together and divided by 100. The soil physical parameters *viz.*, bulk density, particle density, per cent porespace, maximum water holding capacity and volume expansion were also studied by keen Raczowsky box measurements and the average value are estimated.

RESULTS AND DISCUSSION

The results (Table 1) showed that the solid of south side of Kanjamalai hills are bit alkaline but not of very serious concern. As for as the available N,P,K was concerned, there was a wide variation observed in the status. The available N content was low (69%) to medium (3%) in range. Despite, the soil was under scrub jungles, the N content in the soil was not observed to be high. As such the application of nitrogenous fertilizers to give a satisfactory crop performance is very much needed. With regard to the available P content, the entire samples tested recorded low (100%) values. Hence, adequate phosphorus fertilizers are most needed. Usage of rock phosphate may be beneficial to this location. Enriched farm yard manures, rock phosphate besides biofertilizer like VAM, Phosphobacteria may improve the P status of the soil. Similarly, the level of K in the soil also showed concern. Unless adequate potassium fertilizers are applied, the crop performance will not be satisfactory. Generally, the nutrient status of the soils of Kanjamalai hills is not to the satisfactory level. It is also very much necessary to build up the organic matter status of the soil by incorporating plenty of well sieved compost, farm manure, organic wastes. The soil recorded appreciable cation exchange capacity with the good supply of calcium and magnesium to sustain crop production.

The nutrient index (Table 1a) for the available phosphorus is 1.08 and for potassium is only 1.58 being both are low. The physical properties of the tested soil (Table 2) show the adequate porespace level but the maximum water holding capacity of the being only average and the same could be enhanced by incorporation of abundance of organic manures. Being located on hills, possibility of soil erosion is quite possible. As such, such soils

Table 2. Physical properties of Kanjamalai hill soils (Mean values)

Site Details	Bulk Density ($Mg\ m^{-3}$)	Particle density ($Mg\ m^{-3}$)	Pore space (%)	Max. Water holding capacity (%)	Vol. expansion ml/100 g soil
650m East side	1.37	3.00	60.40	46.77	7.19
700m East side	1.42	3.62	64.08	45.11	10.21
450m West side	1.57	3.69	59.97	37.50	4.17
650m West side	1.56	3.57	52.06	33.14	4.23
500m South side	1.41	3.00	54.88	38.18	2.02
550m South side	1.53	3.57	62.20	42.60	9.75
450m North side	1.32	2.54	57.36	38.48	4.65
550m North side	1.26	2.74	54.38	41.36	2.31
750m North side	1.23	2.94	62.72	32.92	8.37
800m North side	1.25	2.86	60.78	45.43	9.38
930m North side	1.34	3.27	63.05	48.30	9.98
975m North side	1.47	3.20	58.58	40.48	7.97
Siddarkoil Plain 400m	1.62	3.43	55.37	35.27	3.46
Plain lands	1.32	2.94	60.65	48.30	8.08

Table 3. Available micronutrients contents in Kanjamalai hill soils

	Micronutrients			
Micronutrient content	Cu	Zn	Mn	Fe
Range (ppm)	1.6 - 11.7	0.4 - 3.4	9.8 - 93.4	12.4 - 41.0
Mean (ppm)	4.2	2.2	47.8	29.0
Percentage calculation				
1.2 ppm	0.0	39.0	0.0	0.0
1.2 - 2.0 ppm	21.0	28.0	0.0	0.0
2.0 - 4.0 ppm	46.0	29.0	0.0	0.0
4.0 - 8.0 ppm	26.0	4.0	6.0	0.0
8.0 - 12.0 ppm	7	0.0	39.0	6.0
12.0 ppm	1.0	0.0	55.0	94.0
Critical level 0.2	1.2	2.0	4.5	
Standard deviation	1.6	0.9	27.5	6.5
Coefficient of variation	34.0	37.0	59.0	26.0

require appropriate soil conservation practices, to control the soil erosion.

The data on the micronutrients (available) are presented in Table 3. The mean value for Cu, Zn, Mn and Fe are 4.2, 2.2, 47.8 and 25.0 ppm respectively. Considering the critical level of 1.2 ppm for Zn, (Tandon, 1991) 39 per cent soils registered deficiency in Zn and need application of Zinc for increasing the efficiency of the crop production. Cu, Mn and Fe having a critical level of 0.2, 2.0 and 4.5 ppm. (Tandon, 1991) respectively, all tested soils show adequate supply of the nutrients. The level of micronutrients in the soil tested are in order of Mn Fe Zn respectively.

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INTERRELATION SHIP, MULTIPLE REGRESSION AND PATH ANALYSIS OF CHLOROPHYLL CONTENT AND SEED YIELD ATTRIBUTES IN RAINFED SOYBEAN

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ABSTRACT

Evaluation of 40 genotypes of soybean indicated the presence of chlorophyll 'b' (FIN), chlorophyll 'a' (ON), chlorophyll 'b' (FIN), total chlorophyll (FIN) and total chlorphyll (ON). Carotene per cent (FIN) showed a strong association with chlorophyll 'b' (FIN), total chlorophyll (FIN) and total chlorophyll (ON). Multiple regression showed the importance of chlorophyll 'b' (FIN) and total chlorophyll (FIN) for number of leaflets/plant, carotene per cent (FIN) for days to 50% flowering, chlorophyll 'a' (FIN) for days to maturity and total chlorophyll (FIN) for seed yield/plant, which was also supported by the results of path coefficient.

KEY WORDS : Chlorophyll 'a', 'b' and total, rainfed, soybean

It is a continuous process in plant breeding to improve the existing varieties. The selection of the parents having high genetic variability is a basic requirement in any successful hybridisation to produce desirable combinations for selecting high yielding genotype. Multivariate analysis by means of Mahalanobis D^2 statistics is a powerful tool in quantifying the degree of divergence among biological population. The information in this aspect is scanty in soybean and therefore, the present study was undertaken to identify suitable stable donors having wider genetic distance and a high interrelationship in respect of chlorophyll 'a', chlorophyll 'b', carotene percent and total chlorophyll through correlaiton, multiple regression and path coefficient.