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STUDIES ON MORPHOECONOMIC AND BIOCHEMICAL CHARACTERS OF FEW PROMISING MULBERRY GENOTYPES UNDER DROUGHT PRONE CLIMATIC CONDITIONS OF AHMEDNAGAR DISTRICT, MAHARASHTRA.

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ABSTRACT Mulberry, a sole food source of silkworm- Bombyx mori L. is grown for its foliage. Among the different factors, the mulberry leaf contributes more than one third (33%) for cocoon production. Mulberry leaf yield is a complex character and is highly influenced by the environment. Even the genotypes are same they may show significant variation particularly in the total yield, major elements, minor elements, protein content etc. which ultimately affect the quality of biomass and in turn the quality of silk due to the factors like nature of soil, season, temperature, frequency of irrigation etc. The comparative account of all the three varieties clearly suggest that S1635 is equally compatible or to be precise better than V1 and S36 hence S1635 can also be recommended for drought prone climatic conditions of Ahmednagar district.

KEYWORDS : Mulberry Varieties, Morpho-economic And Biochemical Characters

INTRODUCTION -

Mulberry, the sound basis of Sericulture, is the only food source of silkworm *Bombyx mori* L. and is grown only for its foliage. Among the different factors, the mulberry leaf contributes more than one third (33%) for cocoon production. Mulberry leaf yield is a complex character and is highly influenced by the environment. Also leaf quality of mulberry (Morus spp.) is influenced by a number of factors such as variety, cultivation practices, incidence of pests and diseases, method of harvesting and preservation of leaves [1] which plays an important role in the nutrition of the silkworm (Bombyx mori) to produce cocoons and silk. It is calculated that about 60 % cost of production of silk is from mulberry alone. This shows the importance of food plant in the economics of Sericulture. Though the genotypes are same they may show significant variation particularly in the total yield, major elements, minor elements, protein content etc. which ultimately affect the quality of biomass and in turn the quality of silk due to the factors like nature of soil, season, temperature, frequency of irrigation etc. [3]Keeping in view all these influences, the present study was undertaken to identify the genotypes with better morpho-economic and biochemical characters. [4,5] Hence, it is necessary to understand the effects of the climatic conditions, irrigation, moisture content, soil type and temperature on the growth of mulberry in our district. [7,8] Such studies with respect to above parameters are not standardized for our climatic conditions. Thus, this is the first attempt in Ahmednagar district to document the indigenous knowledge of mulberry cultivation which is geographically specific.

MATERIAL AND METHODS -

The cuttings of three mulberry varieties viz V_1, S_{36} and S_{1635} of age 8-10 months having the 3-4 buds and about 15-20 cm long were planted at 90 X 60 cm in Mahatma Phule Krishi Vidyapeeth, Rahuri tehsil, district Ahmednagar,Maharashtra. Mulberry variety V_1 which is the most dominant variety in south India promoted and commonly distributed to the farmers in Ahmednagar district. It is a diploid mulberry variety cultivated under irrigated conditions. Under ideal agro climatic situation and consistent care this genotype yields 60-70 tonnes of foliage per hectare in one year. It is a fast growing taxon exhibits good rooting and sprouting ability. This taxon revealed 2n = 28 chromosomes While S_{1635} is a triploid variety has been recommended for irrigated eastern region of India . [9,10] This taxon revealed 2n = 42 chromosomes. Yield of green foliage for S_{1635} variety is 60-70 tonnes per hectare per year under ideal agro climatic situation. Where as S_{36} is an aneuploid variety. This taxon revealed 2n = 30 chromosomes. This variety is suited for both rainfed and irrigated condition. Under ideal agro climatic conditions this genotype yields 40-45 tonnes per hectare per year. These two varieties are very rarely distributed to the farmers of Ahmednagar district.

The soil of experimental plant was of antisol order and shivneri soil series. The soil pH was 7.22.The soil available nitrogen and phosphorus was low [147 and 8.53 kg ha -1 respectively.] The soil available potassium content was moderate 258 kg ha -1.

The land was ploughed up to 30-45 cm depth. The ploughing was repeated 2-3 times to get good tilt and to destroy weeds. FYM was applied at 20 tonnes per ha. and mixed thoroughly. The manure field was divided into convenient sized plots.

The experiment was laid out in split-split plot design by using 100 cuttings of each variety in three replications. Frequent irrigation and fertilizer doses were given as per recommendation.

Propagation characters such as sprouting per cent, survival ability, growth attributes as length of the branch and branching pattern, yield parameters as internodal distance, leaf area, number of leaves per plant [biomass], fresh weight of the leaf, leaf yield, leaf size and number of branches per plant were recorded by following standard procedure.

The moisture content of the leaf was determined on the green dry weight basis. The biochemical studies were carried out in the tender, medium, coarse leaves .For quantification of proteins method was followed. The nitrogen content of mulberry leaves was estimated. Phosphorus was determined by using vanadomolybdate yellow color method in nitric acid. Potassium was determined by using flame photometer method. Cu [Copper], Fe [Iron], Mn [Magnesium] and Zn [Zinc] were determined by using atomic absorption spectrophotometer [11,12]

OBSERVATIONS AND DISCUSSION -

In present study, the varied response of drought prone climatic condition in respect to morphological and biochemical characters have been observed.

Morphoeconomic characters Comparative Morphoeconomic data of three mulberry varieties are summarized in Table 1.

Table-1Comparative morpho economic data of three mulberry varie ties viz V_1, S_{1635} and S_{36}

	Sprouting %	Survival %	Number of branches	Length of branches	Internodal distance	Green leaf weight	Leaf area	Biomass
V_1	**93.8±0.27 (0.75)**	**31.3±0.18 (0.49)**	**1.6±0.12 (0.33)**	**76.2±0.52 (1.47)**	**3.7±0.06 (0.17)**	**134.6±0.16 (0.44)**	**233.9±0.29 (0.82)**	**483.8±0.36 (1)**
S_{1635}	**91.7±0.11 (0.29)**	**79.8±0.29 (0.82)**	**3.5±0.11 (0.29)**	**116±0.52 (1.45)**	**4.8±0.12 (0.33)**	**265.1±0.27 (0.75)**	**350.5±0.5 (1.4)**	**856.5±0.11 (0.29)**

S_{36}	**83.4±0.41 (1.15)**	**72.9±0.37 (1.02)**	**4±0.16 (0.44)**	**108.4±0.48 (1.34)**	**3±0.16 (0.44)**	**122.4±0.36 (1)**	**193.8±0.18 (0.49)**	**526.3±0.38 (1.07)**

Sprouting percentage of mulberry was significantly influenced by the genotypes. It was significantly higher in V_1 [93.8%] over S_{36} [83.4%] and statistically on par with S_{1635} genotype [91.7%].The success of well establishment of mulberry genotype depends on sprouting ability. It is an established fact that sprouting is a genetic trait of a genotype; however the role of agro-climatic conditions and moisture is a binding factor influencing the sprouting. [Dandin and Kumar, 1989].

Table-2 Comparative Biochemical data of three mulberry varieties viz V_1, S_{1635} and S_{36}

		Moisture %	Crude Protein%	Nitrogen % (N)	Phosphorus %	Potassium % (K)	Copper (Cu) ppm	Iron (Fe) ppm	Manganese (Mn) ppm	Zink (Zn) ppm
V1	**Tender**	**66.57±2.16 (8.64)**	**21.33± 0.76 (3.05)**	**3.41± 0.36 (1.44)**	**0.77± 0.17 (0.69)**	**1.15± 0.32 (1.28)**	**1.54± 0.15 (0.61)**	**44.5± 1.33 (5.32)**	**22.51±1.70 (6.80)**	**1.29± 0.12 (0.46)**
	Medium	**64.32±1.10 (4.49)**	**15.71± 1.68 (6.71)**	**2.51± 0.32 (1.28)**	**0.56± 0.15 (0.61)**	**0.65± 0.12 (0.46)**	**1.84± 0.17 (0.69)**	**91.17±0.99 (3.94)**	**27.51±1.80 (7.19)**	**2.79± 0.15 (0.61)**
	Coarse	**62.07±2.6 (10.38)**	**11.02± 0.55 (2.20)**	**1.76± 0.40 (1.61)**	**0.51± 0.06 (0.23)**	**0.35± 0.10 (0.40)**	**2.34± 0.12 (0.46)**	**169.5±0.29 (1.15)**	**42.51±0.95 (3.80)**	**7.79± 0.81 (3.25)**
S1635	**Tender**	**72.09±1.6 (6.39)**	**21.42± 2.26 (9.03)**	**3.43± 0.23 (0.92)**	**0.62± 0.12 (0.46)**	**1.99± 0.12 (0.46)**	**2.83± 0.20 (0.80)**	**111.52±2.21 (8.84)**	**30.42± 1.96 (7.80)**	**4.45± 0.35 (1.40)**
	Medium	**69.84±0.67 (2.66)**	**15.79± 2.16 (8.64)**	**2.53± 0.06 (0.23)**	**0.42± 0.06 (0.23)**	**1.49± 0.85 (3.38)**	**3.13± 0.15 (0.61)**	**161.52±2.11 (8.44)**	**35.42± 0.78 (3.12)**	**5.95± 0.61 (2.43)**
	Coarse	**67.59±2.09 (8.34)**	**11.10± 1.48 (5.93)**	**1.78± 0.27 (1.06)**	**0.37± 0.10 (0.40)**	**1.23± 0.12 (0.46)**	**3.63± 0.06 (0.23)**	**236.52±1.25 (5.00)**	**50.42±2.21 (8.84)**	**10.95±0.52 (2.08)**
S36	**Tender**	**73.43±1.96 (7.81)**	**26.08± 0.53 (2.11)**	**4.17± 0.21 (0.83)**	**0.38± 0.12 (0.46)**	**2.21± 0.12 (0.46)**	**1.81± 0.15 (0.61)**	**8.08± 0.99 (3.94)**	**28.49±1.16 (4.63)**	**3.93± 0.40 (1.61)**
	Medium	**71.18±0.17 (0.69)**	**20.42± 1.95 (7.80)**	**3.26± 0.06 (0.23)**	**0.18± 0.17 (0.42)**	**1.71± 0.06 (0.23)**	**2.11± 0.21 (0.83)**	**57.7± 1.90 (7.59)**	**33.49±0.79 (3.17)**	**5.43± 0.23 (0.92)**
	Coarse	**68.93±1.36 (5.42)**	**16.33±2.29 (9.16)**	**2.61±0.29 (1.15)**	**0.13±0.10 (0.40)**	**1.41±0.35 (1.38)**	**2.61±0.20 (0.80)**	**132.7±0.35 (1.40)**	**48.49± 2.01**	**10.43± 0.23**

Note- Bracket values contain CD at 5 %

In mulberry, leaf moisture plays a vital role in improving nutritive level of leaves which in turn improve the palatability of leaves of silkworm. This is a genetic character and influenced by soil moisture, and root proliferation nature of a variety [Sujathamma and Dandin, 2000].

DISCUSSION :

For proper vegetative growth of mulberry plant, requires various mineral elements, so the exact evaluation of nutrient requirement is important for the economic point of view. The nutritive value of mulberry leaf has a considerable influence on the growth and development of silkworm. Leaves reflect the nutrient status of the plant so the leaf analysis has been accepted as a diagnostic tool for assessing the nutrient requirements.

The major nutrients like Nitrogen [N], Phosphorus [P] and Potassium [K] play an important role in plant growth and development, while micronutrients like Cu, Fe, Mn, Zn also essential for plant growth and development. [13]

The nitrogen content in tender leaves of mulberry variety $S_{36}$was found significantly superior (4.17) over V_1 and S_{1635} [3.41 and 3.43 % resp.]also the nitrogen content of medium leaves of S_{36} was more [3.26per cent] followed by S_{1635} [2.53 per cent] and V_1 [2.51 per cent].While in coarse leaves was 2.61 in S_{36}, 1.78 in S_{1635} and 1.76 in V_1, while, the mulberry genotype V_1 recorded significantly higher phosphorus in tender leaves [0.77 %] over S_{1635} (0.62 %) and S_{36} [0.38%]. However, numerical phosphorus content in tender leaves was more followed by medium and then in coarse leaves.

The mulberry genotype S_{36} [2.21%] was found significantly superior for potassium content in tender leaves over genotype V_1 [1.15%] and on par with S_{1635} [1.99%]. The potassium content in tender leaves of mulberry was numerically higher than medium and coarse leaves. The lower value of potassium content was observed in coarse leaves of mulberry.[14]

The micro nutrients as Cu, Fe, Mn, Zn, Ca and Mg etc are essential for normal plant growth and development. Among these Cu [Copper], Fe [Iron], Mn [Magnesium] and Zn [Zinc] were analyzed for quantification.

Copper plays an important role in the nutrition of mulberry and also growth of silkworm The mulberry genotype S_{1635} was recorded signif icantly higher copper content in tender leaves [2.83 ppm]. Manganese is also one of the most important micro nutrients for mulberry. The deficiency of manganese induced chlorosis. Numerically genotype V_1 recorded less values of manganese [22.51 ppm] than S_{1635} and S_{36} [30.42 and 28.49 ppm resp.]. The manganese content of medium and coarse leaves of mulberry showed similar trend to that found in tender leaves. However, the concentration of manganese was increased from tender leaves to medium and coarse leaves of mulberry. [15,16]

Mulberry leaf yield is a complex character and is highly influenced by the environment. Even the genotypes are same they may show significant variation particularly in the total yield, major elements, minor elements, protein content etc. which ultimately affect the quality of biomass and in turn the quality of silk due to the factors like nature of soil, season, temperature, frequency of irrigation etc. Several scientists have reported different quality traits such as leaf moisture content, protein content, carbohydrate content, nitrogen content, are responsible for leaf quality [17,18] reported that no single variety consists of all the nutrients at the highest level. All the quality traits or nutrients may not be available at the highest level in a genotype as there are several factors, such as nutrients uptake, absorption of water, nitrogen utilization efficiency etc., which are involved and differ from genotype to genotype. Therefore, it is most essential to identify a genotype posse ssing some of the important quality traits together, which may help to improve the growth and cocoon characters of silkworm. But it is clear from the study that the mean values of all the characters studied of the S_{1635} variety are very much similar or better than V_1. Overall performance of all the three varieties for morpho economic characters and biochemical analysis showed that variety S_{1635} showed better result than V_1 and S_{36} for majority of the characters. [19,20]Thus comparative account of V_1 and S_{1635} revealed the fact that survival per cent, number of branches, length of branches, biomass, nitrogen percentage, protein percentage and moisture percentage of both the varieties are compatible or precise better than V_1 . The comparative account of all the three varieties clearly suggest that S_{1635} is equally compatible or to be precise better than V_1 and S_{36} as majority of morpho economic characters and biochemical characters are better in variety $S_{1635.}$ Thus, in nutshell the study suggests that variety S_{1635} should be promoted with V_1 in Ahmednagar district. Since, it shows all the better qualities under the stress of drought-prone area under cultivation in Ahmednagar district.

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