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STUDIES ON THE PHOSPHATIC AND POTASSIC FERTILIZERS REQUIREMENT OF MULBERRY (*Morus alba* L.) BASED ON SOIL TEST VALUES

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ABSTRACT

Two field experiments with different levels of phosphorous and potassium fertilizers were conducted to determine phosphatic and potassic fertilizers requirements of mulberry under rain fed condition based on soil test values. The biomass production (yield) of mulberry at different levels of phosphorus and potassium fertilizers were subjected to Mitscherlish- Bray equation to estimate the important parameters responsible for mulberry growth and production, namely, theoretical maximum yield (A), efficiency factor for soil nutrient(C1) and efficiency factor for added fertilizer nutrient (C). By utilizing the estimated C1 and C values, a ready reckoner of phosphatic and potassic fertilizers requirements for mulberry has been prepared with respect to sandy loam soil.

Key words: Mitscherlich- Bray equation, theoretical maximum yield, phosphatic and potassium fertilizers.

INDTRODUCTION

The profitability of sericulturist depends on quality and yield of leaves of the food plants on which the silk worm are fed. Maximization of leaf yield per unit area will lead to increase in cocoon production per hectare at reduced cost (Sinha *et al*., 2002). The improvement in quality and yield depends on the nutrient status of the soil and proper addition of fertilizers. Several studies have been carried out on the effect of fertilization and other agronomical practices on the yield and quality of mulberry leaf (Pain, 1965; Kasiviswanathan and Iyengar, 1970; Ray et al., 1973). These studies were limited to generalization. Fertilizer recommendations were not based on soil test values. Kar *et al*., (2000) developed only nitrogen fertilizer recommendation for mulberry for different nitrogen availability. Hence, this study has been undertaken to assess potassic and phosphatic fertilizers requirements of mulberry based on soil test values.

MATERIALS AND METHODS

Two experiments were conducted in uniform conditions in experimental fields of Centre for Integrated Sericulture Research, Jorhat for consecutive three years for the assessment of phosphatic and potassic fertilizers requirement for mulberry under rain fed condition. For the assessment of phosphatic fertilizer requirement, the experiment was conducted with varying levels of phosphorus (0, 15, 30, 45 and 60 kg /ha/year) and potassium (50 kg/ha/year). Similarly, for the assessment of potassium fertilizer requirement, the experiment was carried out with varying levels of

potassium (0, 15, 30, 45 and 60 kg/ha/year) and phosphorus (50 kg/ha/year).

Randomized Block Design with four replications was followed for both the experiments. A sample size of 36 plants per replication with 90cm × 90 cm spacing was considered suitable for the experiment. Soil texture, pH, available N, P & K were determined following the methods described in the text book of Soil and Plant Analysis by Piper(1966).

Two years old S1635 mulberry variety was taken for both the experiments. The plantation was maintained following the recommended package of practices for respective field. Treatments were applied in two equal splits. Leaf and shoot yield data were recorded crop wise. Annually, three crops were harvested. Annual biomass was computed by pooling three crops data.

The data so obtained were subjected to Mitscherlich- Bray equation (Shete and Sonar, 1993) which is as follows for assessment of phosphorus and potassium requirements for mulberry based on soil test values.

$$\log (A-Y) = \log A - C1b - Cx$$

Where, A is theoretical maximum yield, Y is actual yield obtained, b is native soil nutrient, C1 is efficiency factor for soil nutrient, x is added fertilizer nutrient and C is efficiency factor for added fertilizer nutrient.

RESULTS AND DISCUSSION

The initial soil characteristics under both the experiments have been shown in Table 1. Effects of different doses of phosphorus and potassium on the annual biomass yield have been presented in Table-2 and 3 respectively. It is evident from both the tables that biomass yield increases with the increase in phosphorus and potassium levels. With the increase in phosphorus level, biomass yield increases from 30.20 to 38.66 ton/ha whereas, increase in potassium level was found to be 27.93 to 35.89 ton/ha. These results are in agreement with the findings of Ray *et al*., 1973 and Das *et al*., 1993. The data obtained were subjected to Mitscherlich- Bray equation and A, C1 and C calculated. Theoretical maximum yields 'A' for different levels of phosphorus and potassium application are 44.67 ton/ha and 39.81 ton /ha respectively. The ratio C1/C is higher under different levels of phosphorus application and lower in case of potassium application. It indicates that utilization of higher rate of P and lower rate of K would give optimum biomass yield. This observation is similar to Shete and Sonar (1993).

The mean C1 and C values for phosphorus and potassium have been employed in Mitscherlich-Bray equation for preparation of phosphatic and potassic fertilizers

Table-1: Initial Characteristics of experimental soil

Characteristic	Phosphorus Expt.	Potassium Expt.
Texture	Sandy loam	Sandy loam
pH (1:2.5)	5.05	5.17
Organic carbon (%)	0.36	0.40
Alkaline KMnO4 – N(kg/ha)	200	220
Bray-P(kg/ha)	18	13
NH4OAC-(kg/ha)	75	87

Table-2: Mulberry biomass yield and efficiency coefficients of soil and phosphatic fertilizer under rain fed condition

P2O5 (kg/ha/yr) applied (x)	Yield (ton/ha)	Calculated (y)	1/x	C1 log y	C	C1/C
0	30.20	-	-	0.0223	0.0073	3.81
15	33.34	1.52	0.067	-	0.0083	
30	36.56	1.56	0.033	-	0.0065	
45	37.33	1.57	0.022	-	0.0065	
60	38.66	1.59	0.017	-	0.0063	
Mean				0.0223	0.0586	

Theoretical max. yield: 44.67 ton/ha

Table-3 Mulberry biomass yield and efficiency coefficients of soil and potassic fertilizer under rain fed condition

P2O5 (kg/ha/yr) applied (x)	Yield (ton/ha)	Calculated (y)	1/x	C1 log y	C	C1/C
0	27.93	-	-	0.0045	-	
15	32.59	1.500	0.0667	-	0.0105	
30	33.88	1.530	0.0333	-	0.0101	0.48
45	35.24	1.547	0.0222	-	0.0091	
60	35.89	1.555	0.0167	-	0.0080	
Mean				0.0045	0.0094	

Theoretical max. yield: 39.81 ton/ha

Table 4: Phosphatic fertilizer recommendation chart for mulberry

Soil test value P2O5 (kg/ha)	Targeted yield, % of theoretical maximum		
	70	75	80
	Fertilizer P2O5 (kg/ha/yr) required		
5	72	86	104
10	53	66	85
15	33	47	64
20	14	27	45
25	0	7.5	25
30	0	0	5.5

Table-5: Potassic fertilizer recommendation chart for mulberry

Soil test value P2O5 (kg/ha)	Targeted yield, % of theoretical maximum		
	70	75	80
	Fertilizer P2O5 (kg/ha/yr) required		
25	43	52	63
50	32	40	51
75	20	28	39
100	8	16	27
125	0	5	15
150	0	0	3

recommendations (Table 4&5). Table 4 & 5 clearly indicates that requirements of phosphorus and potassium depend on soil test values and targeted yield.

Thus, from the present study, a ready reckoner for utilization of phosphatic and potassic fertilizers has been prepared which will prevent the irrational application of fertilizers. Further, preparation of ready reckoner by Mitscherlich-Bray concept indicates that this concept can be successfully employed for soil test based fertilizer recommendation in mulberry cultivation.

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