Soma Karmakar *et al*, International Journal of Advances in Agricultural Science & Technology,
Vol.10 Issue.4, April 2023, pg. 1-12

ISSN: 2348-1358
Impact Factor: 6.901
NAAS Rating: 3.77

Influence of Different Sources of Manure on theBio-Chemical and Mineral Constituent on the Leaf of Host Plant of *Antheraea mylitta* Drury

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DOI: 10.47856/ijaast.2023.v10i04.001

Article Info

Received: 09-01-2023 *Revised: 01 -02-2023* *Accepted: 25-03-2023*

ABSTRACT:

The tropical silkworm *Antheraea mylitta* is commercially exploited for it immense economic importance in sericulture industry, which feeds mainly on the leaf of Arjun, Asan and Sal and spin cocoon. The quality of silk depends upon the quality and quantity of the leaf they feed on. So, keeping this in mind the present study was carried out using two different organic manure i.e. Sheep and Poultry manure along with biofertilizer and inorganic manure. The different treatment showed significant improvement on the experimental plant. The moisture contained of the leaf ranged from 60.788-79.077%. While the crude protein ranged from 2.572-11.124% and total carbohydrate ranged from 38.489-158.307 mg g^{-1}. The nutrient content of leaf i.e. N% ranged from 0.4177-1.8098% with highest in K_{10} (1.764%). The phosphorus per cent ranged from 0.0486-0.4611% with highest (0.45%) in K_{11} and the potassium per cent ranged from 0.7435-1.8504% with highest in K_9 (1.8%). The dry matter were found to be ranged from 114.13-486.469 g/plant with highest in the leaf of K_8(469.56g).

Keywords: Carbohydrate, Dry matter, Poultry manure, Sericulture and Silkworm

INTRODUCTION

Tussar silk is obtained from the silkworm *Antheraea mylitta* Drury (Insecta: Lepidoptera: Saturniidae) that feed on the local tree like Sal, Arjun and Asan so called 'Wild Silk' (Vigneswaran et al., 2015), have two varieties viz. Tropical and Temperate tasar. Tropical tasar Silkworm *Antheraea mylitta* Drury is commercially exploited for production of Vanya silk and a large number of poor families depend on tasar culture for their livelihood (Bambhaniya et al., 2017). It involves women member of the family in rural areas particularly in rearing and reeling, spinning, weaving while man members are mainly engaged in the field. In sericulture about 53% of women are involved in different activities (Ninga setty et al., 2017). The silkworm *Antheraea mylitta* D derives almost all their nutrient from the leaf they fed for growth and development. From the leaf they derive the 70% of silk

ISSN: 2348-1358
Impact Factor: 6.901
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protein (Sanappa and Umesha, 2014). Hence, to obtain an abundant quantity of cocoon the silkworm should fed on good quality of leaves (Vijaya et al., 2009). Continuous use of chemical fertilizer has led to ill health of soil which gradually reduces the leaf yield and quality (Rashmi et al., 2009). For successful lifecycle, cocoon quality, metamorphosis to moth stage and their reproductive activity, availability of essential nutrients in food plant is vital(R Monohar Reddy et al.,2010). Organic inputs enhance SOC and N content more significantly over chemical fertilizers thus lead to higher microbial population (Pratibha and Shachi,2017) but suffers from drawback of low content of plant nutrient (Adhikari et al., 2016).Long term application of nitrogen-phosphorus-potassium(NPK) based fertilizer bring pronounced effect on the soil biochemical properties and Soil Organic Carbon(SOC),Nitrogen(N) content, pH, Moisture which lead to shift in microbial population thus bring variation in nutrient availability to microbe (Bunemann and McNeil 2004;Bohmaet al.,2005;Wu et al.,2012). Application of chemical fertilizers alone can supply only one or two nutrient elements to the crop (Adhikari et al., 2016) and also require excessive amounts of water, which led to drastic fall in groundwater levels and also destroy life forms vital to food production(Radha hollabhar,2007). It is not possible to meet the nutritional requirementsfrom the organic source only. Due to slow release of plant nutrients from organic matter making the potentialities of organic source very limited (Miah, 1994).Nutrients from organic manure are supplemented with inorganic nutrients are readily available to plants(Ayoola & Mankinde, 2008). Application of fertilizer and manures in the soil fortified the nutrient status that boosts the leaf yield because nutrients are continuously removed from the soil by cropsin addition to losses by leaching and erosion (Barna chakraborty,2018). Nutrients are releasedmore slowly from organic manure and stored for longer time periods in the soil thus ensuring a long residual effect (Abou el magh, Hoda mohammad & fawz,2005). Organic fertilizers andorganic residual materials are important sources of Nitrogen, Phosphorus, Potassium and Organic Carbon which replenish the humus (Dr. Thomas Nessel,2015) by increasing the organic content in the soil and increasing microbial activity(Radha hollabhar,2007).Thus, the present work was carried out to study the Influence of different sources of manure on the Bio-chemical and Mineral constituent on the leaf of host plant of *Antheraea mylitta* Drury.

MATERIALS AND METHODS

The research was carried out in the field of Research Extension Centre, Kapistha, Purulia.The experiment was carried out in Complete Randomized Block Design with eleventreatments replicated thrice (Table 1). The treatment consisted of different sources of organic,inorganic and biofertilizers manures to that of untreated control.

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Table 1:Treatment details

Treatments	Treatments detail
K_1	Absolute control
K_2	RDF
K_3	AB
K_4	PSB
K_5	75%RDF+PSB
K_6	75%RDF+AB
K_7	AB+PSB
K_8	Poultry manure
K_9	Sheep manure
K_{10}	75%RDF+Poultry manure +AB+PSB
K_{11}	75% RDF+ Sheep manure +AB+PSB

Sample collection

Fresh leaf sample from each treatment were collected and bought to the laboratory for analysis of different parameters.

Evaluation of Biochemical Parameters and Nutrients content of food plant of Tropical Tasar Silkworm

Leaf moisture(%)

Fresh leaves were harvested from each treatment and weighed in electronic balance to note the fresh leaf weight. Then, the leaves were oven dried at 70ºC for 48 hours and the dry weight was recorded and expressed on fresh weight basis (Gravemetric Method). The leaf moisture content was calculated as per the standard of A.O.A.C 1970.

$$\text{Moisture \%} = \frac{\text{Fresh weight of leaf} - \text{Dry weight of leaf}}{\text{Fresh weight of leaf}} \times 100$$

Crude protein of leaf(%)

The crude protein content of the leaves of Asan and Arjun was estimated by multiplying the nitrogen content by factor 6.25(Jackson,1973).

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Total carbohydrate content

Total carbohydrate of the leaf sample was determined using Anthrone Method (E.E. Layne,1975; David T. Plummer ,1990).

Total Nitrogen Content

Per cent of nitrogen in the leaf sample were determined by Kjeldhal's method (Humphries EC,1956)..

Total Phosphorus Content

Total phosphorus was determined by Vanado-molybdate phosphoric acid yellow colour method at 730 nm (Jackson, M.L.,1967)..

Total Potassium Content

It was estimated by using Flame-Photometer from the Extract obtained by digestion with di-acid mixture (.Chapman and Brown, 1950).

STATISTICAL ANALYSIS

The collected data were analyzed statistically by descriptive analysis and the mean difference were analyzed using Duncan's Multiple Range Test(DMRT) (Gomez and Gomez 1984).

RESULTS AND DISCUSSIONS

The combined application of manure increases the release of macro as well as micronutrients which increases various nutritional parameters of leaf i.e. Dry matter production, Crude Protein content, Total carbohydrate, leaf moisture content and leaf nutrient content. The result showed that application of different manure showed significant improvement in the nutritional parameters.

LEAF BIO-CHEMICAL CONSTITUENT

Leaf moisture content(%)

Moisture content of the leaf is related to soil available moisture content and proliferation of root. The digestibility of silkworm is determined by the moisture content of leaf (Kasiviswanathan et al.,1973). The moisture content of leaf varies from 64-83%(Yokoyama,1975) and above 70% moisture content is considered optimum (Singh and Singh.1976). The moisture content of the leaf ranged from 60.788-79.077% with a mean of 68.30%. The highest mean of moisture content in the leaf of arjun was recorded in K_3 applied with Azotobacter(76.33%) followed by K_5(71.33%) and K_9(70%) over the control(63%). Increase in leaf moisture due to organic manure and biofertilizer was reported by(Kerenhap et al.,2007;Barna and Manab,2015).

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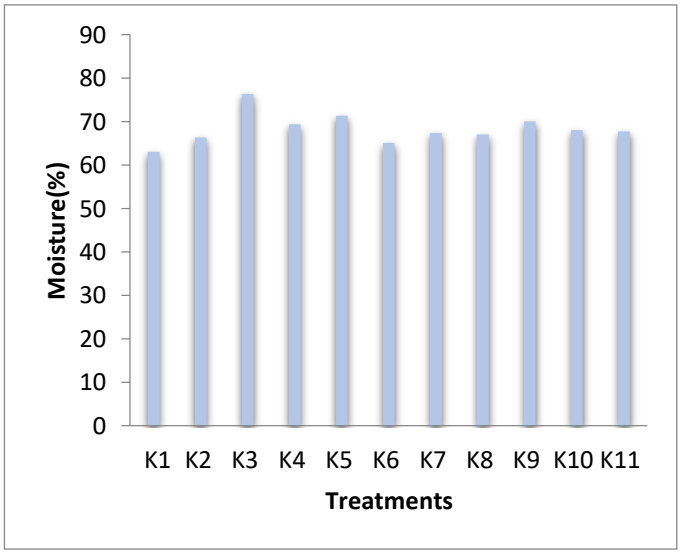
Table2: Influence of INM practices on Moisture (%)

Treatments	Moisture%	
	Mean	Rank
K1	**63^{e}**	11
K2	66.33^{cde}	9
K3	**76.33^{a}**	1
K4	69.33^{bc}	4
K5	71.33^{b}	2
K6	65de	10
K7	67.33^{cd}	8
K8	67^{cd}	7
K9	70^{bc}	3
K10	68^{bcd}	5
K11	67.66^{bcd}	6
Mean	**68.30**	
S.Em±	**0.6625**	
Range	**60.788-79.077**	
CD (95.0%)	**1.3495**	

Fig1: showing the Influence of INM practices on Moisture (%)



Crude Protein (%) and Total Carbohydrate content (mg/g)

Crude protein (%)

The crude protein per cent ranged from 2.572-11.124% with an average of 6.32%.Highest crude protein content was recorded in K_{10}(11.025%) was applied with 75%RDF+Poultry manure+ PSB+AB was followed by K_{11}(8.58%) and K_7(7.88%). The integrated effect of NPK fertilizer, organic manure plus bio-effect of microorganisms such as N_2 fixing bacteria, phosphorus dissolving bacteria increase the protein content by making the nutrient available (Ewees and Osman,2013). Petterson and Wistinghawen (1979) also reported significant difference in protein content of potatoes fertilized chemically and organically. With the application of poultry manure the total soluble protein content in mulberry leaf increased(Kerenhap et al.,2007). Chakraborty et al.,(2008) also confirmed increase in soluble protein with the application of poultry manure plus biofertilizers.

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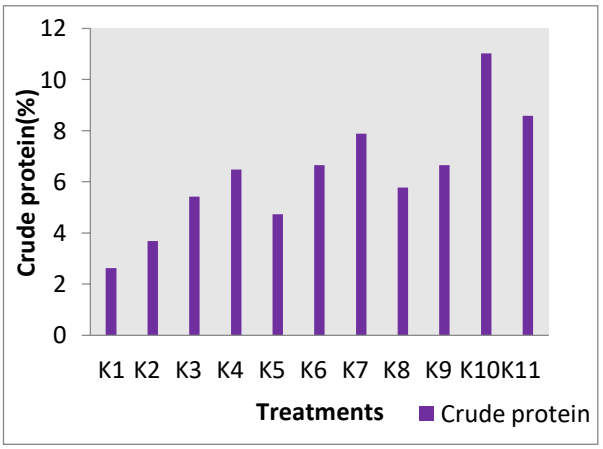
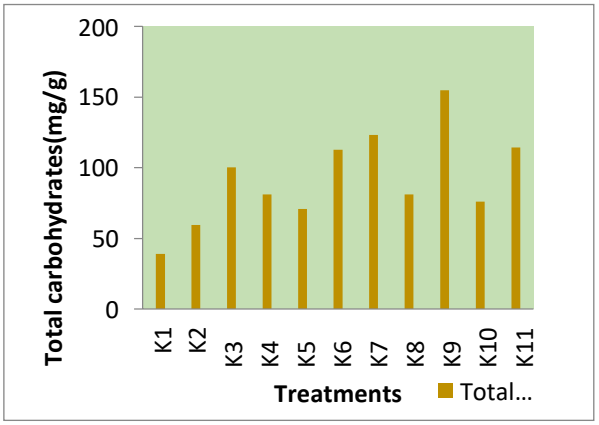
Total Carbohydrate Content of Leave

Application of integrated manure significantly influenced the total carbohydrate content. The total carbohydrate content was found to be in the range of 38.489-158.307 mg g^{-1} with a mean of 92.04 mg g^{-1}, highest carbohydrate content was recorded (154.9 mg/g) with sheep manure(K_9) was followed by K_7(123.1 mg/g) and K_{11}(114.3 mg/g) over the control. Due to improved mineralization the total sugar content in the leaf increased which enhanced the production of plant growth substances and enzyme activity which was in close conformity with Vijaya et al.,2009. Similarly, Rashmi et al.,2009 recorded higher total sugar content due to application of chemical fertilizers along with biofertilizers compost, vermicompost, green manure and castor cake.

Treatments	Crude protein (%)		Total carbohydrate(mg/g)	
	Mean	Rank	Mean	Rank
K1	**2.625^{g}**	11	**39.0^{i}**	11
K2	3.693^{f}	10	59.6^{h}	10
K3	5.425^{e}	9	100.3^{d}	5
K4	6.479^{d}	6	81.1^{e}	7
K5	4.728^{e}	8	70.8^{g}	9
K6	6.654^{c}	5	112.8^{c}	4
K7	7.88^{b}	3	123.1^{b}	2
K8	5.779^{d}	7	81.1^{e}	6
K9	6.654^{c}	4	**154.9^{a}**	1
K10	**11.025^{a}**	1	76.0^{f}	8
K11	8.580^{b}	2	114.3^{c}	3
Mean	**6.32**		**92.09**	
S.Em±	**0.3928**		**5.526**	
Range	**2.572-11.124**		**38.489-158.307**	
CD(95.0%)	**0.8002**		**11.256**	

Table3: Crude protein (%) and Total carbohydrate (mg/g) content of leaf





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Nutrient content in Leaf

Increased Nitrogen, Phosphorus and Potassium content in leave might be due to increased availability of nutrients in soil due to application of Organic manure, Chemical and Biofertilizer.

Nitrogen(%)

The total nitrogen content ranged from 0.4177-1.8098% with a mean value of 1.011%. Application with 75% RDF+ Sheep manure + AB + PSB(K_{10}) had higher nitrogen content in leaves(1.764%). There was no significant difference were observed between K_4,K_6 and K_9 treatments applied with PSB,75%RDF+AB,Sheep manure respectively. Increase in N content in the leaf of arjun has been attributed by the release of N from both Organic forms and chemical fertilizers(Herenkende and Parama,2010).

Phosphorus(%)

The phosphorus content ranged from 0.0486-0.4611% with a mean of 0.2146%. Phosphorus content of leaves(0.45%) was higher due to application of 75%RDF+Sheep manure+ AB+ PSB over the control(0.05%). The increase in P content attributed due to utilization of native P and/or due to enhanced dissolution of P by organic acids produced during the decomposition of organic matter(Heenkende and Parama,2010).Singhve et al.,(2000) and Rajegowda et al.,(2000) reported increase in phosphorus content in mulberry due to application of seri-boost.

Potassium (%)

The potassium ranged from 0.7435-1.8504% with a mean of 1,4365%. The highest potassium content obtained in K_9 (1.8%) was applied with sheep Manure only. Increase in K resulted due to release of K from organic manures or due to the action of organic acids which promotethe release of mineral bound insoluble K (Heenkende and Parama,2010). Application of poultry and goat manures increase the total available potassium which helps in formation of starch and sugar(Kerenhap et al.,2007).the application of recommended FYM+NPK recorded significant higher macronutrients in mulberry leaf followed by sheep manure+ recommended FYM (Rajanna et al.,2000). Increase in N.P and K was also reported by Md. Arifur Rahmanet al, 2018 due to combined application of vermicompost+ chemical fertilizer was also in harmony with Akca and Sam sunlu.2012.

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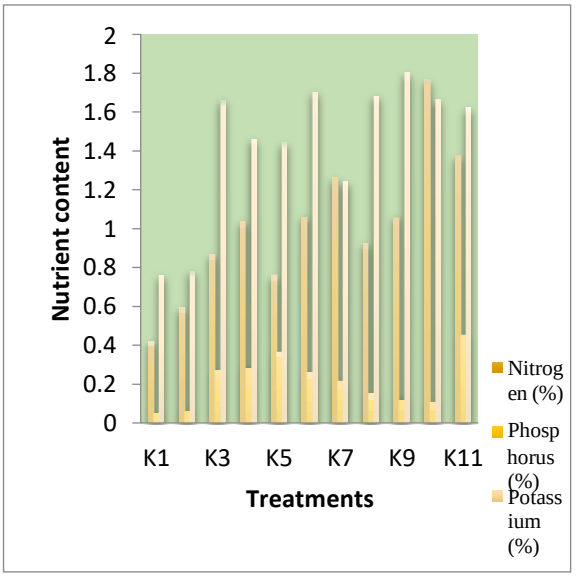
Table 4: Nutrient content of leaves after INM practices

Treatments	Nitrogen (%)	Phosphorus (%)	Potassium (%)
K1	**0.42**	**0.05**	**0.76**
K2	0.5908	0.07	0.78
K3	0.868	0.271	1.66
K4	1.0367	0.2938	1.46
K5	0.7565	0.3604	1.44
K6	1.0647	0.26	1.7
K7	1.2609	0.2128	1.24
K8	0.9247	0.15	1.68
K9	1.0647	0.136	**1.8**
K10	**1.764**	0.107	1.66
K11	1.3729	**0.45**	1.62
Mean	**1.011**	**0.2146**	**1.436**
S.Em±	**0.0628**	**0.0212**	**0.06136**
Range	**0.4177-1.8098**	**0.0486-0.4611**	**0.7435-1.8504**
CD(95.0%)	**0.128**	**0.0432**	**0.125**

Fig 3: Influence of INM practices on Nutrient content



Dry matter content(g)

The increase in dry matter is due to luxurious vegetative growth in terms of plant height, number of leaves, leaf area, stem girth and number of branches. The increased availability and influence of nitrogen due to beneficial effect of biofertilizers like *Azospirillium* for formation of protoplasm, which enhances cell division and cell enlargement(Anita mohanty et al.,2018). The dry matter content was found in the range of 114.13-486.46g with a mean of 267.881 g. Dry matter was observed higher in leaves of K_8(469.56g) was applied with poultry manure and was followed by treatment K_5(365.58g),K_{11}(315.38g),K_6(308.72g) and K_{10}(305.97g). Increase in dry matter contained was also reported by Chung et al.,2000 and Purbajanti et al.,2016 that organic manure application supplemented with an adequate amount of inorganic fertilizer resulted in relatively high dry matter yield of corn(Ali Baghdadi et al.,2018).

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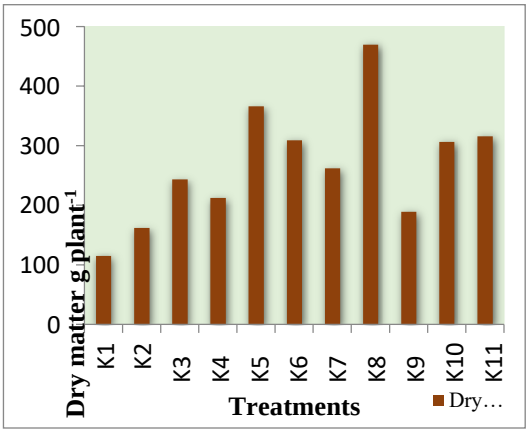
Table 5: Dry matter content influenced by INM practices

Treatments	Dry matter g plant^{-1}	
	Mean	Rank
K_1	**114.75^{i}**	11
K_2	161.4^{h}	10
K_3	242.85^{e}	7
K_4	211.92^{f}	8
K_5	365.58^{b}	2
K_6	308.72^{c}	4
K_7	261.8^{d}	6
K_8	**469.56^{a}**	1
K_9	188.76^{g}	9
K_{10}	305.97^{c}	5
K_{11}	315.381^{c}	3
Mean	**267.881**	
S.Em±	**16.938**	
Range	**114.13-486.46**	
CD(95%)	**34.503**	

Fig4: Influence of INM practices on Dry matter content



CONCLUSION

The present investigation inferred that application of organic manure along with inorganic and biofertilizer significantly influenced all the parameters assayed. Which showed improvement in the quality and quantity of the leaf of cocoon production .Thus, we should recommended more use of INM practices in sericulture to have a sustainable sericulture practices without causing much harm to the soil physico-chemical properties and micro-environment.

ACKNOWLEDGEMENT

The authors are greatly thankful to the Director of Central Tasar Research & TrainingInstitute for providing the lab facility and In-charge of Research Extension Centre, Kapistha, Purulia.

ISSN: 2348-1358
Impact Factor: 6.901
NAAS Rating: 3.77

REFERENCES

[1]. Vigneswaran C., Ridhu Nivethinni D., Shilpaa K. and Dhanapal Sheetal 2015. Tussar silk: Scope for improving Quality by Enzyme Technology. JTATM., 9(3):1-9.

[2]. Bhambhaniya K.C., Naik M.M. and Ghetiya L.V. 2017. Biology of Tasar silkworm, Antheraea mylitta Drury under indoor conditions. Trends in Biosciences 10(1):126-131. ISSN-0974-8431.

[3]. Ninga Setty H H, Gopal Lasya and Chinnaswamy K.P. 2017. Empowerment of women through Tasar Sericulture activities in Jharkhand state. IOSR Journal of Humanities and Social Science 22(12): 60-65. www.iosrjournals,org.

[4]. Umesha A. and Sannappa B. 2014. Bio-chemical and Mineral constituents of Mulberry leaf raised through organic based nutrients in Red loamy soil. International Journal of Advanced Research 2(9):348-355.

[5]. Vijaya, D., Yeledhalli, N.A., Ravi, M.V., Nagangoud, A. and Nagalikar, V.P.2009. Effect of fertilizer levels and foliar nutrients on M-5 mulberry leaf nutrient content, quality and cocoon production. Karnataka J. Agric. Sci. 22(5):1006-1012.

[6]. Rashmi, K., Shankar, M.A., Shashidhar, K.R. and Narayanaswamy, T.K.2009.Growth and foliar constituents of Mulberry(M5) cultivated under organic based nutrient management. Int. J. Indust. Entomol. 19(1):165-169.

[7]. Manohar Reddy R., Charan Rupesh, Prasad B.C., Siva Reddy C., Manjula A and Sivaprasad V. 2010. Rearing and Grainage performance of Indian Tropical Tasar silkworm, *Antheraea mylitta* Drury fed on *Terminalia tomentosa*(W&A) and *Lagerstroemia parviflora* (Roxb.). Food Plants Acad. J. Entomol. 3(3):69-79.

[8]. Prashar Pratibha and Shah Shachi 2016. Impact of fertilizers and pesticides on soil microflora in Agriculture Sustainable Agriculture Reviews, Sustainable Agriculture Reviews 19. E. Lichtfouse (ed.) Springer International Publishing Switzerland. Pp.331-361. DOI 10.1007/978-3-319-26777-7-8.

[9]. Adhikari P, Khanal A, Subedi R 2016. Effect of different sources of organic manure on growth and yield of sweet pepper. Advances in Plants & Agriculture Research 3(5):158-161.

[10]. Bunemann EK, McNeil A 2004.Impact of fertilizers on soil biota. In: Lines R (ed.) proceedings current research into soil biology in agriculture. Kelly. Iamworth. pp 64-71.

[11]. Bohme I., Langer U, Bohme F 2005. Microbial biomass enzyme activities and microbial community structure in two European long term field experiments. Agric Ecosyst. Environ 109:141-152.

[12]. WUF, Gai Y, Jiao Z, Liu Y, Ma X, An L, Wang W, Feng H 2012. The community structure of microbial in arable soil under different long-term fertilization regimes in the Loess plateau of China. Afr. J. Microbial Res 6:6152-6164.

[13]. Hollabhar Radha 2007. People's Manual on organic manures and bio-fertilizers. Janhit Foundation.D-80, Shastri Nagar, Meerut. pp 6-9.

[14]. Miah, M.M.U.1994. Prospects and problems of organic farming in Bangladesh. Paper presented at the workshop on integrated nutrient management for Sustainable agriculture held at SRDI, Dhakha. 26-28.

[15]. Ayoola OT, Makinde EA 2008. Farming systems. Research and extension programme, Institute of Agricultural Research and Training, Obafemi. African Journal of Plant Science 2(3):019-022.

[16]. Chakraborty Barna 2018. Evaluation of the leaf productivity of *Terminalia arjuna* and its impact on commercial traits of Tropical Tasar sericulture *(Antheraea mylitta* Drury) under organic based agro-forestry system. Proceedings of ISER 125th international conference, Malacca, Malaysia. pp 6-8.

[17]. Abou el magh MM, Hoda Mohammed A, Fawz ZF 2005. Relationship Growth and yield of Broccoli with increasing N, P or K Ratio in a mixture of NPK fertilizers. Annals of Agricultural Science Moshtohor Journal 43(2):791-805.

ISSN: 2348-1358
Impact Factor: 6.901
NAAS Rating: 3.77

[18]. Nessel Thomas 2015. Application of organic fertilizers and organic residual materials in Agriculture. Scientific Advisory Board on Fertilizer Issue at the Federal Ministry of Food and Agriculture. pp 11- 12.
[19]. AOAC 1970. Official methods of analysis (Ed. Daniel Banes) Published by A.O.A.C., Washington, D.C. Bangalore, p 105.
[20]. Jackson, M.L. 1973. Soil chemical analysis, Prentice Hall of India .Pvt. Ltd., New Delhi pp: 498.
[21]. Layne E.E. 1975.Methods in Enzymology,3: pp 447
[22]. David T. Plummer 1990.An Introduction to practical Biochemistry,179,Third edition.
[23]. Humphries EC 1956. Mineral components and ash analysis, Springer and Verlag, Berlin 1:468-502.
[24]. Jackson, M.L. 1967.Soil Chemical analysis Prentice Hall of India Pvt. Ltd., New Delhi; p 205.
[25]. Chapman, H.D. and Brown, S.M. 1950. Analysis of plant leaves for diagnosing nutrient status with reference to potassium. Hilgardia.19:501-540.
[26]. Gomez, K.A and Gomez, A.K. 1984.Statistical procedures for Agricultural Research 2nd edn. John Wiley and Sons. New York.207-215.
[27]. Kasiviswanathan, K., Krishnaswami, S. and Venkada Ramu, C.V.1973. Effect of Storage on the Moisture content of Mulberry leaves. Indian J. Seric. 12,13-21
[28]. Yokoyama, T.1975 (Ed.)Text. Book of Tropical Sericulture. Japan overseas cooperation volunteers. Tokyo. pp 444-537.
[29]. Singh, S.P. and Singh, O.P.1976.Changes in protein turnover and related biochemical correlates during embryonic development of *Philosamia ricini.* Entomon.4:327-329.
[30]. Kerenhap, W., Thaigarajan V. and Kumar,V. 2007.Biochemical and bioassay studies on the influence of different organic manure on the growth of Mulberry variety V_1 and Silkworm *Bombyx mori* Linn. Caspian Journal of Environmental Science. 5(1):51-56.
[31]. Chakraborty Barna and Kundu Manab 2015. Effect of biofertilizer in combination with organic manure on growth and foliar constituents of mulberry under rainfed lateritic soil condition. The International Journal of Engineering and Science 4(3):16-20.
[32]. Ewees, M. S.A. and A. Sh. Osman 2013. Partial Substitution of Mineral Nitrogen Fertilizers by BioFertilizer to Alleviate the Possible Risks of Chemical Pollution for Broccoli Plants. Egypt. J. Soil Sci., 53(2): 175 – 194.
[33]. Pettersson, B. D. and Wistinghausen, E. V. 1979. Effects of organic vs inorganic fertilizers on soils and crops. Miscellaneous Publication # 1. Woods End Agricultural Institute Temple, Maine.
[34]. Kerenhap, W., Thaigarajan V. and Kumar,V.2007.Biochemical and bioassay studies on the influence of different organic manure on the growth of Mulberry variety V_1 and Silkworm *Bombyx mori* Linn. Caspian Journal of Environmental Science. 5(1):51-56.
[35]. Chakraborty, B., Chandra, A.K. and Chakraborty, S.K. 2008. Effect of integrated nutrient supply on growth, leaf yield and field performance of mulberry (*Morus alba*) under semi irrigated lateritic soil condition of West Midnapore District West Bengal. Journal of Environmental and Sociobiology 5(2):221-226.
[36]. Vijaya, D., Yeledhalli, N.A., Ravi, M.V., Nagangoud, A. and Nagalikar, V.P.2009. Effect of fertilizer levels and foliar nutrients on M-5 mulberry leaf nutrient content, quality and cocoon production. Karnataka J. Agric. Sci. 22(5):1006-1012.
[37]. Rashmi, K., Shankar, M.A., Shashidhar, K.R. and Narayanaswamy, T.K.2009.Growth and foliar constituents of Mulberry(M5) cultivated under organic based nutrient management. Int. J. Indust.Entomol., 19(1):165-169.
[38]. Heenkende A.P. and Parama V.R.P.2010. Effect of Silkworm Pupae compost on soil N-mineralization, Nutrient Uptake, crop yield and plant nutrient contents of French Bean(*Phaseolus vulgaris* L.).Tropical Agricultural Research. 21(4):391-397.

ISSN: 2348-1358
Impact Factor: 6.901
NAAS Rating: 3.77

[39]. Singhvi, N.R., Sarkar, A. and Datta, R.K. 2000. Effect of Seri-boost on the mulberry leaf yield and some commercial characters of silkworm, *Bombyx mori* L. Nat I. Conf Strat, Ser. Res. Dev., Nov.16- 18, CSRTI, Mysore.P.59.

[40]. Rajegowda, Sundar, P. and Raghu, B.V.2000. Foliar D Spray of Ser-boost on mulberry and its impact on cocoon production. Proc, Nat I Sem. Tropic. 99(2):163-167.

[41]. Rajanna, B.H., Chinnaswammy, K.P., Govindan, R., Sannappa, B. and Sundarraj S.2000. Effect of Sericulture by-products and other organic manure on leaf yield and Elemental composition of mulberry. Bull. Ind. Acad. Seric., 4:70-74.

[42]. Zaman M.M., Rahman Md. Arifur, Chowdhury Tanzin and Chowdhury M.A.H. 2018.Effects of Combined application of chemical fertilizer and vermicompost on soil fertility, leaf yield and Stevioside content of Stevia. J. Bangladesh Agril Univ. 16(1):73-81.

[43]. Akca, Y and Samsunlu, E 2012. The effect of salt stress on growth, chlorophyll content, proline and nutrient accumulation and K/Na Ratio in Walnut. Pak J. Bot., 44(5):1513-1520.

[44]. Mohanaty Anita, Srichandan S and Behera P 2018. Effect of integrated nutrient management on nutrient uptake in marigold in different seasons. The Pharma Innovation Journal 7(5):13-16.

[45]. Chung RS, Wang CH, Wang CW, Wang YP 2000. Influence of organic matter and inorganic fertilizer on the growth and nitrogen accumulation of corn plants. Journal of Plant Nutrition 23(3):297-311.

[46]. Endang Dwi purbajanti, Florentina Kusmiyati, Widyati Slamet and Praptiningsih Gamawati Adinurani 2016.Cholorophyll, crop growth rate and forage yield of Brachiaria (*Brachiaria brizantha* Stapf) as the result of goat manure in various nitrogen dosage. AIP Conference Proceedings. 1755(1). https://doi.org/10.1063/1.4958557.

[47]. Ali Baghdadi, Ridzwan A. Halim, Ali Ghasemzadeh, Mohd Fauzi Ramlen and Siti Zaharah Sakimin 2018. Impact of organic and inorganic fertilizers on the yield and quality of silage corn intercropped with soybean. PeerJ 6:e5280 https://doi.org/10.7717/peerj.5280

