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Enhancement Of Silk Production Through Water Conservation In Chikodi Area

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Abstract

In this study it is understood that trenches filled with biomass would retain water for long time which may be utilized by the mulberry plants continuously so, leaf quality will be good leading to high yield in the form of silk. As biomass decays minerals and plant nutrients in biomass are released which may be utilized by growing mulberry plants, so no need to supply additional nutrients in the form of fertilizers. When only trenches are made and biomass is not used water is retained for long time, growth of plants was not luxuriant because, there was no biomass and yield is low compared to trench with biomass (for luxuriant growth additional nutrient have to be supplied). Land without trench and biomass (normal land) retains water for very short period. In such land for proper growth of plants is not possible and yield is definitely very low (for luxuriant growth additional nutrient and water have to be supplied regularly).

It is understood from the non irrigated piece of land that even without irrigation sericulture may be practiced even in summer seasons (if rain fall is normal). Even in irrigated land water supply to land with trenches filled with biomass is very less. The number of times of water supply was not same for the three portions (1. trench with biomass, 2. trench without biomass and 3. without trench and biomass). Number of times of water supply to the portion – trench with biomass is half the number of times of water supply to the portion-trench without biomass and one-fourth the number of times of water supply to the portion –without trench and biomass. Naturally trench filled with biomass retains more water for long time compared to the trench without biomass, similarly, water holding capacity of loose soil(trenched portion) is more than the normal land.

Water requirement to the land with trenches filled with biomass is just one forth of water required to normal land (without trench and biomass). Therefore, by adapting trench filled with biomass system one can widen area under sericulture four times with available water. It is quite possible to enhance silk production through water conservation.

Keywords*: Sericulture, leaf weight, cocoon weight, shell weight.*

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Introduction

Sericulture has made enormous strides in the recent years in the country. The base of the mulberry silk industry depends on the mulberry plants which form the only source of food material for rearing of silkworms and cocoon production. India is gifted with a rich source of mulberry plantation and is characterized in having tropical, sub tropical as well as temperate sericulture belts, where rearing of mulberry silkworms is in vogue. The world wide silk demand is increasing day by day and India has a great potential of increasing its cocoon production to a considerable extent by popularizing the sericulture in the hither to unknown regions, by evolving improved strains of silkworm and mulberry varieties and at the same time through water conservation. Sericulture is practiced in more than 50 countries of the world under tropical and sub-tropical conditions.

Mulberry which is the sole food of silkworm (*Bombyx mori* L) grows in a wide range of soils, but best growth is obtained in loamy to clayey loam soils. The mulberry plant can tolerate slightly acidic conditions in the soil. In the case of too acidic soils application of Dolomite or Lime should be adopted. In case of alkaline soils, application of Gypsum should be resorted for correction of the soil alkalinity (Jalaja, 2001).

Intensive cultivation is the method evolved by man to improve agriculture production. High yield with low input has been the main objective of agriculture technology from time immemorial. The same holds good for mulberry cultivation. This objective attains greater importance for success of the sericulture industry since the silkworm, *B. mori* has universal preference for mulberry as food plant. Amount and quality of foliage produced in an unit area over a specific time determine the level of returns to the farmer.

The productions of silkworms are of definite importance and the output depends on the quality of food taken. Therefore, quantitative and qualitative aspects of egg production are significantly affected by better conversion of consumed food. The quantitative characters of cocoon are also affected markedly by nutritional input. Water, a major requirement of worms, is not always present in sufficient quantities in the leaf. Reduced water content in leaf could lead to slower growth rate resulting in smaller pupae and cocoon with less silk content. Reduced water level would affect the balance of other components indirectly. There has been a good correlation established between the soluble nitrogen levels, their quality and fecundity in many insects.

The sericulture farmers have since long been, however, adopting systemic utilization of compost and farm yard manure (FYM). To observe impact of farm fresh green mulching on mulberry crop performance and leaf production on account of their impact on silkworm crop generation and cocoon yield has been the subject of the present study. In the present study, different cultivation methods like trench with biomass, trench without biomass and normal cultivation methods are followed.

Water is one of the essential requirements to boost production of silk. If a farmer wishes to widen the area of mulberry plants which enhances rearing size, water becomes major constraint. Water problem is there in many areas and with several farmers. Even available water is becoming non-useful due to pollution. With available water, farmers have to increase area of sericulture. Water conservation methods like mulching, drip irrigation, rain water harvesting, loosing top soil to hold more water, etc., are practiced. It is known that if more water percolates little deep into the soil moisture persists for long time. Small amount of moisture that persists in soil would support growth of plants and crops. Plants need that small amount of water for luxuriant and proper growth.

In an area where water retention methods are not followed, plants naturally need more water for proper growth. Water conservation or retention methods adopted before plantation would definitely reduce the quantum of water essential for complete growth. Water that is conserved may be used for extending plantation area.

Excess use of water (through irrigation) is not advisable (even if sufficient amount of water is available) because, water that trickles down would take away some nutrients and minerals present in top soil. Thus, plant nutrients and minerals become unavailable for the plants this affecting normal growth. Then for the normal growth additional nutrients in the form of manure have to be supplied, which causes extra financial burden to farmers. Excess use of water also affects soil texture which is one of the very crucial features for better growth of plants.

Materials and Methods

Plant

Mulberry plant (*Morous alba*) is taken as food for silkworm. Total 2000 healthy mulberry samplings were selected for the present study.

Land

Appropriate land was selected for cultivation of mulberry plants near village Mugali, Tq. Chikodi, Dt. Belagavi, St. Karnataka.

Land preparation

As per the specification mentioned in the project proposal, two pieces of land, each was about 10 guntas, have been selected. As per the suggestion of Department of Sericulture the above said land was selected for raising mulberry garden. One piece of land was meant for cultivation under natural condition i.e. without irrigation. Another piece of land was with irrigation facility.

Each piece of land was divided into three equal portions. Trenches of 1.5 feet wide, 1.5 feet deep and 10 feet long were dug in the first two portions. Gap between the adjacent trenches in a row was 1 foot and distance from row to row was 6 feet. The third portion was maintained without trenches.

Trenches in the first portion were filled with wet and dry biomass. Later, biomass was covered by soil. Trenches in the second portion were filled with only soil. Land was leveled after filling all the trenches. Both land pieces are prepared according to above specifications.

Plantation

The sprouted mulberry samplings were used for plantation. Sufficient number of healthy mulberry samplings were planted with 3 feet gap from plant to plant and 3 feet from row to row. Plantation was done in the month of July.

Silkworm rearing

Silkworm laying were collected from Sericultural Research Station at Rayapur, Hubli – Dharwad. Silkworms were reared under normal condition. Total six batches of silkworms were maintained feeding on leaves form six portions of land (prepared as described above) separately. Amount of leaf fed to six batches of worms is same. In each batch 25 randomly selected silkworms were taken for the present study.

Parameters of study

Parameters related directly to silk yield are considered. They are: leaf weight to know moisture content, cocoon weight and shell weight.

Moisture content weight in leaf

Total 50 leaves were selected randomly from each section. Preferably from fourth and fifth branches from the top. Leaves from all the section were collected and checked leaf weight with digital electronic balance. Weight was taken three times. First, fresh leaves i.e. within half an hour of plucking. Second, after 6 hrs and the third, after 12 hrs of plucking.

Cocoon and shell weight

After fourth day of spinning weight of cocoon and shell was observed. 25 cocoons were selected randomly from each group of worms (reared separately by feeding leaves of different sections of mulberry garden). The individual weight of cocoon and shell all the cocoons selected was recorded (Table-7).

Leaf quality and quantity

Leaf quality and quantity were observed in six different cultivation methods. In trench with biomass area plantation growth was very high compare to other two methods, and also good quality and quantity of leaf.

Data analysis

Total data were analyzed by using ANOVA software, to interpret trench with biomass, trench without biomass and normal conditions.

Results

Parameters of study

Parameters related directly to silk yield are considered. They are: Leaf weight to know moisture content, cocoon weight and shell weight.

Results of the land cultivated under normal condition i.e. without irrigation and with irrigation are given below.

Results of the land cultivated under non irrigation

Leaf weight

First rearing

After ANOVA analysis the average fresh leaf weight in 'trench with biomass' section is 4.64 ± 0.11^{aa} gms., in 'trench without biomass' section is 4.51 ± 0.10^{aa} gms. and in 'normal' section are 4.27 ± 0.07^{b} gms.

The average leaf weight after 6 hrs. of plucking in 'trench with biomass' section is 2.69 ± 0.09^{a} gms., in 'trench without biomass' section is 2.54 ± 0.08^{a} gms. and in 'normal' section are 2.24 ± 0.04^{b} gms.

The average leaf weight after 12 hrs of plucking in 'trench with biomass' section is 1.59 ± 0.05^{a} gms., in 'trench without biomass' section is 1.48 ± 0.05^{a} gms. and in 'normal' section are 1.23 ± 0.02^{b} gms.

Second rearing

After ANOVA analysis the average fresh leaf weight in 'trench with biomass' section is 3.74 ± 0.09^{a} gms., in 'trench without biomass' section is 4.16 ± 0.09^{b} gms. and in 'normal' section are 3.37 ± 0.06^{c} gms.

The average leaf weight after 6 hrs of plucking in 'trench with biomass' section is 2.12 ± 0.05^{a} gms., in 'trench without biomass' section is 2.19 ± 0.04^{a} gms. and in 'normal' section are 1.56 ± 0.03^{b} gms.

The average leaf weight after 12 hrs. of plucking in 'trench with biomass' section is 1.20 ± 0.02^{a} gms., in 'trench without biomass' section is 1.18 ± 0.03^{a} gms. and in 'normal' section is 1.01 ± 0.02^{b} gms.

Third rearing

After ANOVA analysis the average fresh leaf weight in 'trench with biomass' section is 3.04 ± 0.06^{a} gms., in 'trench without biomass' section is 1.84 ± 0.05^{b} gms. and in 'normal' section are 1.92 ± 0.03^{b} gms.

The average leaf weight after 6 hrs of plucking in 'trench with biomass' section is 1.53 ± 0.03^{a} gms., in 'trench without biomass' section is 1.35 ± 0.03^{b}

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gms. and in 'normal' section is 0.93 0.01[c] gm.

The average leaf weight after 12 hrs. of plucking in 'trench with biomass' section is 0.89 ± 0.01[a] gm., in 'trench without biomass' section is 0.85 ± 0.02[a] gm. and in 'normal' section is 0.69 ± 0.01[b] gm.

Cocoon weight

First rearing

After ANOVA analysis the average cocoon weight in 'trench with biomass' section is 1.37 ± 0.05 gms., in 'trench without biomass' section is 1.28 ± 0.04 gms. and in 'normal' section are 1.23 ± 0.03 gms.

Second rearing

After ANOVA analysis the average cocoon weight in 'trench with biomass' section is 1.19 ± 0.02 gms., in 'trench without biomass' section is 1.18 ± 0.02 gms. and in 'normal' section are 1.14 ± 0.01 gms.

Third rearing

After ANOVA analysis the average cocoon weight in 'trench with biomass' section is 1.08 ± 0.02[a] gms., in 'trench without biomass' section is 1.05 ± 0.02[a] gms. and in 'normal' section are 0.98 ± 0.02[b] gms.

Shell weight

First rearing

After ANOVA analysis the average shell weight in 'trench with biomass' section is 0.28 ± 0.01[a#] gms., in 'trench without biomass' section is 0.24 ± 0.01[ab#] gms. and in 'normal' section are 0.20 ± 0.01[b#] gms.

Second rearing

After ANOVA analysis the average shell weight in 'trench with biomass' section is 0.19 ± 0.01[#] gms., in 'trench without biomass' section is 0.16 ± 0.01[#] gms. and in 'normal' section are 0.19 ± 0.01[#] gms.

Third rearing

After ANOVA analysis the average shell weight in 'trench with biomass' section is 0.14 ± 0.01[a#] gms, in 'trench without biomass' section is 0.12 ± 0.01[b#] gms. and in 'normal' section are 0.09 ± 0.00[c#] gms.

Results of the land cultivated under irrigation

Leaf weight

First rearing

After ANOVA analysis the average fresh leaf weight in 'trench with biomass' section is 4.59 ± 0.09 gms., in 'trench without biomass' section is 4.77 ± 0.11[b] gms. and in 'normal' section are 4.42 ± 0.09[a] gms.

The average leaf weight after 6 hrs. of plucking in 'trench with biomass' section is 2.69 ± 0.09 gms., in 'trench without biomass' section is 2.63 ± 1.00 gms. and in 'normal' section are 2.65 ± 0.09 gms.

The average leaf weight after 12 hrs of plucking in 'trench with biomass' section is 1.59 ± 0.05 gms., in

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'trench without biomass' section is 1.51 ± 0.04 gms. and in 'normal' section are 1.50 ± 0.05 gms.

Second rearing:

After ANOVA analysis the average fresh leaf weight in 'trench with biomass' section 4.59 ± 0.09 gms., in 'trench without biomass' section is 4.77 ± 1.05^b gms. and in 'normal' section are 4.42 ± 0.09^a gms.

The average leaf weight after 6 hrs of plucking in 'trench with biomass' section is 2.69 ± 0.09 gms., in 'trench without biomass' section is 2.63 ± 0.10 gms. and in 'normal' section are 2.65 ± 0.09 gms.

The average leaf weight after 12 hrs of plucking in 'trench with biomass' section is 1.59 ± 0.05 gms., in 'trench without biomass' section is 1.51 ± 0.04 gms. and in 'normal' section is 1.50 ± 0.05 gms.

Third rearing:

After ANOVA analysis the average fresh leaf weight in 'trench with biomass' section is 4.45 ± 0.09^a gms., in 'trench without biomass' section is 4.44 ± 0.09^b gms. and in 'normal' section are 4.79 ± 0.10^a gms.

The average leaf weight after 6 hrs of plucking in 'trench with biomass' section is 2.72 ± 0.09 gms., in 'trench without biomass' section is 2.75 ± 0.10 gms. and in 'normal' section is 2.71 ± 0.09 gms.

The average leaf weight after 12 hrs of plucking in 'trench with biomass' section is 1.52 ± 0.04 gms., in 'trench without biomass' section is 1.57 ± 0.04 gms. and in 'normal' section is 1.57 ± 0.05 gms.

Cocoon weight

First rearing

After ANOVA analysis the average cocoon weight in 'trench with biomass' section is 1.45 ± 0.04^a gms., in 'trench without biomass' section is 1.43 ± 0.04^a gms. and in 'normal' section are 1.23 ± 0.29^b gms.

Second rearing

After ANOVA analysis the average cocoon weight in 'trench with biomass' section is 1.43 ± 0.05^a gms., in 'trench without biomass' section is 1.43 ± 0.03^a gms. and in 'normal' section are 1.20 ± 0.23^b gms.

Third rearing

After ANOVA analysis the average cocoon weight in 'trench with biomass' section is 1.44 ± 0.41^a gms., in 'trench without biomass' section is 1.43 ± 0.03^a gms. and in 'normal' section are 1.22 ± 0.02^b gms.

Shell weight

First rearing

After ANOVA analysis the average shell weight in 'trench with biomass' section is 0.29 ± 0.12^a gms., in 'trench without biomass' section is 0.24

suitable technology (Rangaswami *et al.*, 1976).

Mulberry is known in India as "Kalpa Vruksha" as all the parts of the plant have many uses (Choudhury, 1997). It is essential to sericulture as the foliage constitutes the sole feed of the mulberry silkworm. Mulberry is a fast-growing tree which, for the convenience of sericulture practices, is maintained as a bush. It produces very large amounts of renewable biomass in the form of branches, shoots, leaves and fruit. If mulberry is used for silkworm rearing it is possible to obtain 30-35 tonnes/ha of leaf every year. By growing mulberry, a farmer obtains fodder, fuel and fertilizer. With regard to fodder for animals, farmers in India feed their cows and goats with leftover branches and leaves from silkworm rearing. Among the several factors that contribute to successful young age silkworm rearing, supply of highly nutritious mulberry leaves as feed is a vital one. The larval period and its maintenance are of utmost importance for the success of sericulture industry since it is the only feeding stage of the insect (N. Mal Reddy and B. Nanjegowda 2011). The qualitative and quantitative requirements of the feed for silkworms differ at different stages of larval period. While it is generally established that the young age silkworms require mulberry leaf of higher succulence, moisture and nutrient contents, the late age worms feed on coarser leaf with less moisture content. Other important factors determining the success of coçoons crop are the health, care and hygiene during the young age silkworm rearing-popularly called the "Chawki Rearing" (Ullal and Narasimhanna, 1987).

Many farmers feed their animals with surplus foliage but always mix it with straw. Farmers also use the mulberry branches for fuel after pruning. Leftover twigs are allowed to dry in the garden itself. Residues of rearing are also converted to valuable FYM for mulberry gardena by putting them in a pit for four to five months prior to use. As mulberry is mainly propagated by cuttings in the tropics and sub-tropics, a certain quantity of pruned branches can be used for the preparation of cuttings and the remainder as fuel (Datta,). The promotion of plant growth as reviewed in Hayat *et al.*, in nutrient cycling (Van Der Heijden MGA *et al.*, 2008) and the degradation of pollutants and pesticides (Pino N *et al.*, 2011). All of these functions are of great importance to both the farmer and society and therefore, it is of great importance to establish in plant developmental study (Choudhury, 1976).

In the present study, we focused on leaf quality and silkworm cocoon and shell quality. In sericulture field mulberry leaf quality plays key role for silk production (Priyadharshini, *et al.*, 2008).

When the leaf quality is good automatically silk production also increases. In this project work trench with biomass and trench without biomass, these two methods were compared with normal mulberry cultivation method. In trench with biomass, the biomass percent is very high compare to two methods, in that essential micro and macro nutrients concentration is high and water storage capacity also high. In trench without biomass macro and micro nutrients are low and water storage capacity also low compare to normal cultivation method. These three different methods are used for analyze leaf quality and after spinning cocoon quality. Data has been collected from three rearing, in each rearing individual leaf and cocoon weight were collected.

Regarding silkworm rearing, the different yield levels of the farmer i.e. attainable yield, anticipated yield and the actual yields for different sample districts were analyzed using One way Analysis of Variance (ANOVA) (Gomez and Gomez 1984). Some leaves weight in favorable seasons and cocoon and shall weight sensitive to climatic factors. Separate ANOVA were carried out for cocoon production per 15 silkworms.

Total 50 healthy mulberry plants were selected in each method for this study. Early morning fresh leaf and checked moisture content by using electric balancer. After balancing stored the normal condition for 6 hrs was measured. After 6 hrs measured the balance of leaf and kept at same condition. Final balance were taken at 12 hrs. These types of procedure were followed for remaining groups.

In first rearing, mulberry leaves of 3 groups compared with respect to moisture content. Total weight of 50 fresh leaves within half an hour of plucking was 231.94g, after 6 hrs and 12 hrs weight was respectively 134.58g and 79.41g. Compared to fresh leaves both 6 hrs. and 12 hrs. leaves weight was decreased. Trench with biomass leaves were compared with both trench without biomass and normal method, in fresh leafes weight was 231.94g per 50 leaves and trench without biomass and normal methods leaves weight was respectively 225.59g and 213.56g. After 6 hrs. trench with and without biomass and normal method leaf weight were respectively 134.58g, 126.91g and 111.76g. Finally, after 12 hrs leafes weight is respectively 79.41g, 73.76g and 61.57g.

There are some significant values in trench with biomass, with normal method nearly < 0.05. In both this groups mean difference was 0.367. In normal method, mean difference with trench with biomass -0.367, significant value was < 0.05. In 6 hrs trench with biomass 134.58g per 50 leaves and trench without biomass and normal method respectively 126.91g and 111.76g per 50 leaves. There is slight significant in trench with biomass group with normal method is <0.001, mean difference is 0.456. Trench with biomass with trench without biomass mean difference was 0.153, significant values is <0.5. Trench without biomass was significant value < 0.05 with normal method and mean difference was 0.303. Trench with biomass significant value <0.5 as compared to trench without biomass mean difference was -0.153. After 12 hrs leaf weights in trench with biomass with trench without biomass mean difference was 0.113, significant value was < 0.5. There was no significant difference normal method, but mean difference was 0.356. Trench without biomass group was mean difference with 0.243value in normal method, there was no significant value. Normal method mean difference value with trench with biomass and trench without biomass respectively -0.356 and -0.243, there was no significance.

In second rearing, fresh leaves total weight from trench with biomass was 208.05g, after 6 and 12 hrs weight respectively 109.39g. and 59.11g. Compare to fresh leaves, both 6 and 12 hrs. leaves, weight was decreased. Trench with biomass leaves were compared with both trench without biomass and normal method, in fresh leaves weight is 208.05g. per 50 leaves and trench without biomass and normal methods leaves weight was respectively 187.00g. and 168.35g. After 6 hrs trench with and without biomass and normal method leaf weight were respectively 109.39g., 105.80g. and 77.78g. Finally after 12 hrs, leaves weight is respectively 59.11g., 58.07g. and 50.31g.

Trench with biomass results mean difference with both trench without biomass and normal methods respectively -0.421 and 0.373, significant values were <0.01. Trench without biomass was significant with trench with biomass <0.005. Normal method was mean difference with both trench with and without biomass -0.373 and -0.794. Only significant with trench with biomass <0.01. After 6 hrs trench with biomass was mean difference between both trench without biomass and normal method -0.718 and 0.560. Significant value with trench without biomass < 0.5. Normal methods were mean difference both trench with and without biomass in -0.560 and -0.632. After 12 hrs trench with biomass was significant with trench without biomass in < 0.1. And mean difference between both that trench without biomass and normal method in 0.019 and 0.19. Normal method mean difference in both trench with and without biomass values was -0.195 and -0.176.

In third rearing, fresh leaves total weight were 152.10g, after 6 and 12 hrs. weight respectively 76.41g and 44.70g. Compare to fresh leaves, in both 6 and

12 hrs leaves weight was decreased. Trench with biomass leaves were compared with both trench without biomass and normal method, in fresh leaves weight is 152.10 per 50 leaves and also trench without biomass and normal methods leaves weight was respectively 91.38g and 95.99g. After 6 hrs trench with and without biomass and normal method leaf weight were respectively 76.41g, 68.26g and 46.41g. Finally after 12 hrs leaves weight is respectively 44.70g, 42.88g and 34.72g.

Fresh leaves in trench with biomass mean difference in both trench without biomass and normal method values are respectively 1.199 and 1.122, no significant with both. Trench without biomass was significant values with normal method in 0.565. After 6 hrs trench with biomass mean difference with both trench without biomass and normal method in 0.173 and 0.600. Normal method difference in mean values with both trench with and without biomass respectively was -0.600 and -0.426, there was no significant. After 12 hrs trench with biomass was significant with trench without biomass in < 0.2, mean difference with trench without biomass and normal method in 0.042 and 0.199. Normal method mean difference with both trench with and without biomass was in negative range respectively -0.199 and -0.156.

Total 15 good quality cocoons were selected for this study. In cocoon weight, in first rearing mean difference in trench with and without biomass with normal methods respectively -0.141 and -0.05, significant in both that < 1.0. Trench with biomass was significant with both trench without biomass and normal methods in < 0.5, mean difference was 0.087 and 0.141. Shell weight in trench with biomass mean difference with both respectively 0.043 and 0.077, significant with only trench without biomass in < 0.06. Normal methods mean difference with both trench with and without biomass were respectively -0.077 and -0.034, significant only with trench without biomass in < 0.2.

In second rearing, cocoon weights in trench with biomass was difference in mean value with trench without biomass and normal method in 0.010 and 0.048, also significant with both in < 1.0. Normal method mean difference with both trench with and without biomass were -0.04 and -0.037, significant with both in < 0.5. Shell weight in trench with biomass mean difference with both respectively 0.032 and 0.066, significant with both in < 1.00. Normal method means difference with both trench with and without biomass are respectively -0.066 and -0.026, significant only with trench without biomass in < 1.00.

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In stage 3, cocoon weights in trench with biomass mean difference with both trench without biomass and normal method in 0.028 and 0.057, significant with only trench without biomass in < 0.005. Normal method was significant with both trench with and without biomass < 0.005, mean difference in booth that in negative values -0.05 and -0.02. Shell weight in trench with biomass mean difference with both respectively 0.036 and 0.105, significant with only trench without biomass in < 0.5. Normal method mean difference with both trench with and without biomass are respectively -0.105 and -0.068, significant only with trench without biomass in < 0.5.

Simultaneously, in another piece of land three portions were made; first portion was with trenches filled with biomass, second portion was with trenches without biomass and the third portion was normal (without trench and biomass). This piece of land was under irrigation.

Total 50 healthy mulberry plants were selected in each method for this study. Early morning fresh leaves were collected and checked for moisture content by using electronic balance. Fresh weight of leaves was taken within half an hour of plucking. After balancing kept open under normal condition for 6 hrs. After 6 hrs. took the weight of leaves and kept at same condition. Final weights were taken after 12 hrs. These types of procedure were followed for remaining groups.

In first rearing, mulberry leaves of 3 groups were compared. Trench with biomass 50 leaves quality data was analyzed. In fresh leaves, total weight were 229.26g, after 6 and 12 hrs weight respectively 136.19g and 79.21g. Compare to fresh leaves the both 6 and 12 hrs leaves weight was decreased. Trench with biomass leaves were compared with both trench without biomass and normal method, in fresh leaves weight was 229.26g per 50 leaves and also trench without biomass and normal methods leaves weight is respectively 222.13g and 220.97g. After 6 hrs trench with and without biomass and normal method leaf weight are respectively 136.19, 137.66g, and 135.56g. Finally, after 12 hrs leaves weight was respectively 79.21g, 78.59g and 78.50g (table -14). There are some significant values in trench with biomass with normal method nearly < 0.05. In both this groups mean difference was 0.367. In normal method, was shows mean difference in trench with biomass -0.367, significant value was < 0.05 (table- 4). In 6 hrs trench with biomass 136.19g per 50 leaves and trench without biomass and normal method respectively 137.66g and 135.56g per 50 leaves .

There is slight significant in trench with biomass group with normal

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method is <0.001, mean difference is 0.456. Trench with biomass with trench without biomass mean difference is 0.153, significant values is <0.5. Trench without biomass was significant value < 0.05 with normal method and mean difference is 0.303. Trench with biomass significant value <0.5 of compare trench without biomass mean difference was -0.153. After 12 hrs, leaf weights in trench with biomass with trench without biomass mean difference was 0.113, significant value was < 0.5. There was no significant with normal method, but mean difference was 0.356. Trench without biomass group was mean difference with 0.243value in normal method, there was no significant value. Normal method means difference value with trench with biomass and trench without biomass respectively -0.356 and -0.243, there was no significant.

In second rearing, compared to fresh leaves the both 6 hrs and 12 hrs leaves weight was decreased. Trench with biomass leaves were compared with both trench without biomass and normal method, in fresh leaves weight is 226.42 per 50 leaves and also trench without biomass and normal methods leaves weight was respectively 217.61g and 219.72g. After 6 hrs trench with and without biomass and normal method leaf weight are respectively 133.87g, 130.03g and 133.46g. Finally after 12 hrs leaf weight is respectively 78.18g, 74.78g and 75.83g.

Trench with biomass results mean difference with both trench without biomass and normal methods respectively- 0.451 and 0.393, significant values were <0.01. Trench without biomass was significant with trench with biomass <0.005. Normal method was mean difference with both trench with and without biomass -0.383 and -0.804. Only significant with trench with biomass <0.01. After 6 hrs, trench with biomass the mean difference between both trench without biomass and normal method was -0.738 and 0.590. Significant value with trench without biomass < 0.5. In normal methods the mean difference both trench with and without biomass is -0.580 and -0.652. After 12 hrs, trench with biomass was significant with trench without biomass is < 0.1. And mean difference between both the trench without biomass and normal method is 0.019 and 0.19. Normal method mean difference in both trench with and without biomass values are -0.195 and -0.176.

In third rearing, compared to fresh leaves the both 6 hrs and 12 hrs leaves weight was decreased. Trench with biomass leaves were compared with both trench without biomass and normal method, in fresh leaves weight is 222.25 per 50 leaves and also trench without biomass and normal methods leaves weight is respectively 218.59g and

219.53g. After 6 hrs, trench with and without biomass and normal method leaf weight are respectively 134.58g, 131.39g and 132.38g. Finally after 12 hrs, leaves weight is respectively 75.80g, 75.7g and 75.02g.

Fresh leaves in trench with biomass mean difference was both trench without biomass and normal method values are respectively 1.299 and 1.222, no significant with both. Values of Trench without biomass were significant with normal method in 0.5665. After 6 hrs mean difference of trench with biomass is significant with both trench without biomass and normal method in 0.273 and 0.700. Normal method was difference in mean values with both trench with and without biomass respectively -0.650 and -0.426, there was no significant. After 12 hrs trench with biomass was significant with trench without biomass in < 0.2, mean difference with trench without biomass and normal method in 0.142 and 0.299. Normal method was mean difference with both trench with and without biomass in negative range respectively -0.299 and -0.256.

Cocoon weight

Total 15 good quality cocoons were selected for this study. In cocoon weight, in stage one, mean difference in trench with and without biomass with normal methods respectively 1.45 ± 0.04[a] 1.43 ± 0.04 and 1.23 ± 0.29, significant in both that < 1.0. Trench with biomass was significant with both trench without biomass and normal methods in < 0.5, mean difference is 0.087 and 0.141. Shell weight in trench with biomass mean difference with both respectively 0.29 and 0.24, significant with only trench without biomass in < 0.06. Normal method mean difference with both trench with and without biomass are respectively -0.077 and -0.034, significant only with trench without biomass in < 0.2.

In stage two, cocoon weight in trench with biomass difference in mean value with trench without biomass and normal method is 1.43 ± 0.05, 1.43 ± 0.03 and 1.20 ± 0.23, also significant with both is < 1.0. Normal method mean difference with both, trench with and without biomass were -0.04 and -0.037, significant with both in < 0.5. Shell weight in trench with biomass mean difference with both respectively 0.28 ± 0.01, 0.23 ± 0.01 and 0.21 ± 0.01, significant with both in < 1.00. Normal method mean difference with both trench with and without biomass are respectively -0.066 and -0.026, significant only with trench without biomass in < 1.00.

In stage three, cocoon weights in trench with biomass mean difference with both trench without biomass and normal method in 1.44 0.41, 1.43 ± 0.03 and 1.22 ± 0.02, significant with only trench without biomass in < 0.005.

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Normal method was significant with both trench with and without biomass < 0.005, mean difference in booth that in negative values -0.05 and -0.02. Shell weight in trench with biomass mean difference with both respectively 0.23 ± 0.01, 0.23 ± 0.01 and 0.21 ± 0.01, significant with only trench without biomass in < 0.5. Normal method mean difference with both trench with and without biomass are respectively -0.105 and -0.068, significant only with trench without biomass in < 0.5.

In the piece of land, under irrigation significance is not much because, water is supplied whenever needed.

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