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Leaf mineral composition of castor genotypes and its relationship with productivity of eri silkworms (*Samia Cynthia ricini* B.)

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Abstract
The growth, yield and reproduction potential of silkworms can be affected by their feed sources to a great extent. Minerals are among important biochemical components of leaves and they may have very big influence in productivity of silkworms. In the present study, eight different castor genotypes (Abaro, Acc 106584, Acc 203241, Acc 208624, Ar sel, Bako, GK sel and local genotype) were evaluated for their leaf mineral composition and effect on eri silkworms (*Samia cynthia ricini* B.) in Melkassa Agricultural Research Center (MARC), East- Shewa zone of Oromia Regional State, Ethiopia. Completely Randomized Design (CRD) with three replications was employed for carrying out feeding trial in a laboratory. The relationship of mineral components of leaves with silkworm parameters was also determined by using correlation coefficient analysis. Overall data Analysis was carried out by using SAS software at 5% probability level. Finally, the leaves of these genotypes showed significant differences among themselves in their mineral compositions. Their effect on rearing performance of eri silkworms was also statistically different when they were fed. Among castor genotypes tested, a genotype named Abaro found to be superior as compared to others by revealing a silkworm rearing performance indicators of 8.17 g matured larval weight, 3.344 g cocoon weight, 2.860 g pupal weight, 0.484 g shell weight and 14.487 % silk ratio, 74.68% effective rate of rearing (ERR), 76.079 % survival rate, 382.00 eggs as fecundity and 88.17 % hatchability of eggs. It was also found to constitute 4.125% nitrogen, 2.30% PPM phosphorus, 6874.5 PPM potassium, 102.033 PPM calcium and 13.467 PPM magnesium among foliar minerals. In addition, relationship of mineral constituents of castor genotypes with rearing performance of eri silkworms showed strong positive correlation of nitrogen and phosphorus contents with larval, cocoon and drainage parameters of eri silkworms. Therefore, it can be concluded that nitrogen and phosphorus contents of castor leaves will determine to the gains on important eri silkworm parameters when theses leaves served as feed sources. As a result, these minerals will be considered as basic parameters for evaluation of castor genotypes for eri silkworms rearing in the future.

Keywords: Samia Cynthia ricini, mineral composition, correlation, rearing performance

1. Introduction

Silk is a functional term used to describe protein fibers that are produced by arthropods. It is a natural protein fiber and is very soft, lustrous, smooth, strong and durable than any natural or artificial fibre (Lamelu, 1998; Hiwar, 2001 and Craig and Riekel, 2002). The industrial use of silk and its economic importance of production finely contributed to the silkworm promotion all over the world (Ramesh-Babu *et al*, 2010).

Tzenov (2007) indicated that there is a good potential for sericulture development, not only in the East Asia, but also in Eastern Europe, Central Asia, Latin America and the Africa Region based up on overall socio-economic and agro-climatic conditions (rainfall, soil, temperature, humidity, light and air). Hence, the developing countries are directing their development strategies on the productivity levels in rural areas (Hajare *et al*., 2007). In Ethiopia, silk has played an important part in the social and religious life of Ethiopia from the earliest days of its history. This silk was imported in large quantities from India, Arabia and China and stored in vast caverns in the central highlands of Ethiopia and Ethiopian Emperors would make prodigious gifts of silk to other churches. Ceremonial umbrellas, binding of sacred books, covers for wooden altars and spectacular hangings have all been produced from silk over the centuries (spring and Hudson, 2002). Recently, silk production from eri silkworm (*S. c. ricini*) is commonly practiced in Ethiopia (Metaferia *et al*, 2007).

The eri-silkworm, *Samia Cynthia ricini* Boisduval, is one of the most exploited and commercialized non mulberry silkworms. It is a sericigenous insect exploited for its valuable eri silk. It is a multivoltine and polyphagous species and it can be reared throughout the year depending on the availability feed. The agro-ecology and feed availability are the major requirements which have significant effect on rearing of larvae of this insect and finally cocoon crop yield and quality (Debaraj *et al*., 2003 and Thangavelu and Phukon, 1983) [34].

Castor (*Ricinus communis* L.) is the primary food plant, which can ensure production of good quality cocoons. However, *Manihot utilissima*, *Heteropanax fragrans*, *Curica papaya*, *Evodia falxinifolia*, *Sapium eugenifolia*, *Jatropa curcas*, *Gomelina arborea*, etc. are secondary and tertiary host plants during unfavorable seasons (Hajarika *et al*., 2003) and (Chowdhary, 1982). Similarly, Dayashankar (1982) [4]. And Devaiah *et al*. (1985) [6]. Have reported the superiority of castor over all other hosts including cassava for larval and cocoon traits.

However, castor shows a wide range of variability in nature.

It has been well recognized that morphological features and nutritive values of the leaves differ significantly from variety to variety and over locations. The morphological traits and nutritional factors could be used in selection of castor genotypes Solanki Joshi, 2001) [32, 16]. In addition, the quality of feeds given to insects generally affects the economic products of insects. So, silkworm nutrition is one and the major factor which affect development and productivity of silkworms (Milner, 2004, Baruah, 2007) [2, 22]. Silkworm nutrition deals about the substances required by silkworm for its growth and metabolic functions and obtained from ingested food and some other nutritional components synthesized through various biochemical pathways including proteinous silk fiber of commercial interest (Takano, Arai, 1978 and Hamano *et al*. 1986) [12].

Silkworms have adapted to feeding to derive and store adequate energy, nutrients and water from the food they consume. Feeding silkworms provides energy for growth, development, reproduction and many of its other needs. Such nutritional requirements in food consumption have direct impact on the overall genetic traits such as larval and cocoon weight, amount of silk production, pupation and reproductive traits. Thus, successful sericulture depends on increased production of leaves with high nutritive values. Therefore, the better the quality of leaves, the greater the chances of getting good cocoon harvest (Krishnaswami, 1978) [17].

Moreover, a significant correlation has been reported between chemical compositions of castor leaf and larval growth and cocoon characters. Nutritional value of food plants either alone or in combination plays an important role in the larval growth and silk productivity. Improvement in larval and cocoon characters has also been witnessed with increase in chemical composition of leaves (Sannappa, Jayaramaiah, 1999) [15, 28].

Therefore, feed stuffs can be analyzed in to different fractions including the ash (minerals). The ash, residue left behind after all organic matter has been burnt off, is a measure of the total content of mineral salts in a food. Minerals constitute very good fraction of silkworm feeds. The role of inorganic salts (minerals) is variable. It has been reported that the silkworm larval structure at different ages utilizes these absorbed minerals (Ito, 1978 and Friend, 1958). Their role in the egg stage is also recognized to regulate the hydrogen ion concentration osmotic pressure. Furthermore, sodium and potassium ions act on protein synthesis. However, the importance of nitrogen has been significantly considered in different stages together with the protein content (Legay 1958) [19]. Among minerals, nitrogen, phosphorus, potassium, magnesium, calcium, iron, silicon, sulphur, aluminium, mangnesium and copper found orderly on the quantity basis from different feeds of silkworms (Fukuda *et al*. 1960; Maynard, Loosli, 1962, Sannappa, Jayaramaiah, 1999) [15, 28]. In another way, Jayaramaiah, Sannappa (1998) [15, 28] find out a positive significant relationship between foliar constituents and important silkworm components. They indicated that larval duration, weight, survivability and effective rate of rearing (ERR) as well as cocoon yield were found to have significant positive relationship with nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.

Therefore, selection of castor genotypes is an important criterion for better growth and development of eri-silkworm (Joshi, Misra, 1982) [16]. However, very little information is available regarding the different castor genotypes in Ethiopia. This work, therefore, attempts to assess the extent of mineral composition of some castor genotypes and find out the relationship with productivity of eri ilkworm, *S. c. ricini*.

2. Materials and methods

2.1 Description of the study area

The study was conducted in Melkassa Agricultural Research Center (MARC). It is found 117 kms away from Addis Ababa and 17 km to southeast of Nazareth in the East-Shewa zone of Oromia region. It is located 8°24'N latitude and 39°12'E longitude having an elevation of 1500 meters above sea level and a mean annual rainfall of 770 mm.

2.2 Foliar nutritional evaluation of castor genotypes

Eight selected genotypes of castor viz. Abaro, Acc 106584, Acc 203241, Acc 208624, Ar sel, Bako, GK sel and local (check) were used in the study. These materials were selected from preliminary research observation for the purpose of seed and leaf yields. The methods of Sannappa, Jayaramaiah (1999) [15, 28] were adopted for foliar nutritional analysis on the above mentioned castor genotypes. The leaf samples were collected after 60 days of sowing at three different heights of the plant viz. top, middle and bottom leaves in paper bags. They were shade dried and then transferred to hot air oven maintained at 70^{O}C until constant weight was obtained. Then, the dried-up leaf samples were grinded in to fine powder and preserved for chemical analysis.

By adopting the techniques and procedures of Sahlemedhin, Taye (2000) [27]. Analysis of mineral compositions for nitrogen, phosphorus, potassium, calcium and magnesium contents were carried out for each castor genotype. To get the estimates, the samples were sent and analyzed by laboratories of EHNRI (Ethiopian Health and Nutrition Research Institute) and Debrezeit Agricultural Research Center. Finally, correlation coefficients were also worked out to know the relationship between foliar constituents of castor genotypes and eri-silkworm rearing performance and cocoon traits.

2.3 Evaluation of castor genotypes on rearing performance of eri silkworms

The above mentioned castor genotypes were used as feed source of eri silkworms in a laboratory. As per the rearing recommendations of silkworms by Dayashankar (1982) [4]. a white plain eri-silkworm breed was used for this experiment and it was reared on the eight castor genotypes. The silkworm rearing room and equipments were cleaned, washed and disinfected with 2% formalin solution at the rate of 800ml per 10m^2 before the commencement of the experiment (rearing). This breed was reared following cellular rearing techniques starting from brushing till cocoon spinning on the eight genotypes. Tender leaves of castor were fed four times a day until the larvae ends II instar stage, and semi tender leaves to III instar while more matured leaves were fed to IV and V instar larvae. The experiment was arranged in Completely Randomized Design (CRD) in three replications. In each replication, 50 worms were used and allowed to complete the larval period. As used by Neupane *et al*. (1990), Singh, Benchamin (2002) [13] and Ramesha *et al.* (2010) [26] matured worms were picked and mounted on the mountages for spinning. On the six day of spinning, the cocoons will be harvested, counted and weighed.

Rearing parameters like larval duration (in hours), body weight of mature larvae (g), percentage of larval mortality and hatchability, cocoon traits (cocoon weight, shell weight and silk ratio), effective rate of rearing (%) and fecundity (number of eggs per female) were recorded to find out rearing performance of the worms on the castor genotypes. As a result the following formulae were adopted for estimation when appropriate.
The following formulae, which were adopted by Singh and Benchamin (2002) [13] used for data on rearing performance:-

Survival rate = Number of larva survived larva x 100 /No. of larva brushed

$$\text{Hatching percent} = \frac{(\text{Number of normal eggs- number of non hatched eggs})}{\text{Number of normal eggs}} \text{x}100$$

Silk ratio = Weight of shell x 100/weight of fresh cocoon

$$\text{Effective rate of rearing (ERR)} = \frac{(\text{No. of larvae spinning cocoon * 100})}{\text{No. of larvae brushed}}$$

3. Data Analysis

Finally, the data for significance determination were analyzed statistically (one-way CRD) by using SAS software at 5% level of significance. Moreover, correlation coefficients of minerals of leaves of the castor genotypes with their corresponding rearing performance and cocoon traits of silkworms was carried out to know their inter-relationship similarly by SAS software at 5% level of significance (SAS Institute Inc,1999-2000).

4. Results

Substantial variability has been obtained in mineral composition of castor genotypes and these differences also caused to variability in rearing performance of eri silkworms when served as feed sources.

4.1 Mineral composition of different castor genotypes

All castor genotypes differed significantly from one another in respect to minerals (nitrogen, phosphorus, potassium, calcium and magnesium) considered in this study. Mean values of foliar compositions of the genotypes are presented in table 1.

a) Nitrogen: The nitrogen content of the leaf material of castor genotypes was significantly different. It was highest in genotypes Bako (4.255%) followed by Abaro (4.125%) but lowest in local check (3.63%).

b) Phosphorus: Phosphorus concentration of leaves of castor genotypes was significantly different from castor genotypes with minimum record of 1.616 PPM in the local check and maximum record of 2.30 PPM in Abaro.

c) Potassium: The potassium content of castor genotypes ranges from 5906.0 PPM in Ar sel to 8027.6 PPM in Acc 208624. This concentration for the local check was at par with Acc 106584 but lower than the records of Acc 208624 and Bako.

d) Calcium: Calcium concentration of castor genotypes has also shown significant difference and ranges from 92.20 PPM (Bako) to 155.089 PPM (Acc 208624). The concentration for local check was lower than Acc 208624 and Acc 106584.

e) Magnesium: Magnesium concentration of castor genotypes was minimum in Acc 203241 (10.617 PPM) and maximum in Bako (17.70 PPM), Abaro (13.467 PPM) and Ar sel (13.033 PPM). The maximum magnesium concentration was obtained from Bako (17.700 PPM) and Acc 208624 (17.456 PPM).

Table 1: Mineral composition of different castor genotypes

Castor genotypes	N	P	K	Ca	Mg
Abaro	4.125^{ba}	2.300^{a}	6874.5 ^{d}	102.033^{f}	13.467^{d}
Acc106584	4.150^{ba}	1.809^{de}	7317.5 ^{cb}	139.944^{b}	16.878^{b}
Acc203241	3.803^{de}	1.782^{e}	6205.8 ^{e}	111.878^{e}	10.617^{e}
Acc208624	3.985^{bc}	1.908^{c}	8027.6 ^{a}	155.089^{a}	17.456^{ba}
Ar sel	3.917^{dc}	2.082^{b}	5906.0^{e}	97.789^{g}	13.033^{d}
Bako	4.255^{a}	2.242^{a}	7503.1 ^{b}	92.200^{h}	17.700 ^{a}
GK sel	4.063^{bc}	1.881^{dc}	7163.9^{cd}	112.522^{d}	12.833^{d}
Local	3.633^{e}	1.616^{f}	7205.9^{cb}	127.400^{c}	15.906^{c}
SE	0.060	0.033	106.194	0.039	0.219
CV (%)	2.613	2.886	2.618	0.057	2.571
Pr	<.0001	<.0001	<.0001	<.0001	<.0001

Note: - Means with the same letter are not significantly different at Pr > 0.05.

4.2 Effect of different castor genotypes on rearing performance

In this experiment, all the characters of eri silkworm rearing like hatching percentage, larval duration, larval weight, single cocoon weight, single shell weight, shell (silk) ratio, larval duration, fecundity, effective rate of rearing (ERR) and survival and showed significant differences when eri silkworm fed with different castor genotypes. The results of silkworm rearing characters fed on different castor accessions are summarized in the table 2.

a) Percentage hatching of egg

Hatching of silkworm egg showed wide significant variation fed on different castor genotypes from 81.50 % % to 95.33 %. The maximum hatching was recorded in Acc 106584 (95.333 %) closely followed by GK sel (93.83 %), but lower hatching percent was obtained from Acc 203241 (81.5%). The local genotype recorded better hatching percent than Acc 203241 and Ar sel only.

b) Duration of life stages

Significantly longer larval durations (604.17 hours) were recorded in the worms fed on bako. However, there was no significant difference among other castor genotypes which showed a range of 588.17 hours to 592.17 hours. Moreover, there was no difference in egg and pupal duration which are average 272 hours for egg stage and 514 hours for pupal duration in all the castor genotypes.

c) Larval weight

Matured worms fed on Bako recorded significantly higher larval weight (8.20 g) followed by worms fed on Acc 106584 (8.05 g), Acc 203241(8.05 g), Acc 208624 (8.05 g). The least larval weight was from local check (7.60 g).

d) Cocoon weight, pupal weight, shell weight and silk ratio

In accordance to yield, maximum single cocoon weight was recorded in those larvae which were fed on the leaves of Abaro (3.344 g) followed by Acc 208624 (3.307 g). The minimum single cocoon weight (3.131 g) was recorded from larvae fed on Acc 203241. Similarly, the highest single pupa weight was obtained from those fed on Abaro (2.860 g) and the lowest was obtained from those fed on Acc 203241 (2.684 g).

Single shell weight of a cocoon revealed significant variation when fed with the different castor accession. Abaro revealed significantly higher shell weight (0.4845 g) but local check showed the least shell weight (0.4425 g). In similar to shell weight, silk ratio was found to be significantly higher in Abaro (14.487 %) closely followed by Bako (14.471 %) and Acc 203241 (14.458 %), while the lowest in the local check (14.07 %).

e) Fecundity

Silkworm fed on Acc 106584 showed significantly higher fecundity (409) followed by GK sel (389). The local check (353) was at par with Ar sel (338) and Acc 203241 (338) was lower performing compared to the rest of others.

f) Effective rate of rearing (ERR)

ERR has also revealed a significant difference when eri silkworm fed on different castor genotypes. Eri silkworm fed on Abaro (74.68 %) recorded higher ERR closely followed by Acc 203241 (73.38 %) and bako (73.15 %). The least ERR was obtained from local check (65.36 %).

g) Survival rate

The highest survival rate was recorded in silkworms reared on Acc 208624 (78.35 %) followed by Bako (77.66 %). The least survival rate was recorded from the local check (66.12 %).

Table 2: Performance of eri silkworm fed on different castor genotypes

Treatment	Hatching percent	Larval duration (hours)	Larval weight (gram)	Cocoon weight (gram)	Pupal weight (gram)	Shell weight (gram)	Silk ratio (%)	Fecundity (%)	ERR (%)	Survival rate (%)
Abaro	88.1667^{b}	584.17^{b}	8.17^{ba}	3.344^{a}	2.860^{a}	0.484^{a}	14.487^{a}	382.000^{cb}	74.68^{a}	76.079^{ba}
Acc106584	95.3333^{a}	584.17^{b}	8.05^{bc}	3.149^{e}	2.695^{e}	0.453^{e}	14.395^{c}	409.000^{a}	69.32^{c}	76.494^{ba}
Acc203241	81.5000^{d}	588.17^{b}	8.05^{bc}	3.131^{e}	2.68^{e}	0.447^{f}	14.281^{d}	337.667^{e}	73.38^{a}	73.864^{b}
Acc208624	87.0000^{b}	588.17^{b}	8.05^{bc}	3.307^{b}	2.830^{b}	0.477^{b}	14.424^{bc}	374.000^{cb}	73.18^{a}	78.349^{a}
Ar sel	82.1667^{d}	588.17^{b}	7.62^{d}	3.216^{c}	2.751^{c}	0.465^{c}	14.458^{ba}	337.667^{e}	70.32^{ba}	70.868^{c}
Bako	86.5000^{cb}	604.17^{a}	8.20^{a}	3.186^{d}	2.725^{d}	0.461^{dc}	14.471^{ba}	368.000^{cd}	73.15^{a}	77.656^{a}
GK sel	93.8333^{a}	592.17^{b}	8.02^{c}	3.205^{dc}	2.747^{dc}	0.458^{d}	14.305^{d}	388.667^{b}	69.92^{bc}	77.748^{a}
Local	84.8333^{c}	588.17^{b}	7.60^{d}	3.144^{e}	2.702^{e}	0.443^{g}	14.073^{e}	353.000^{ed}	65.36^{d}	66.117^{d}
SE	0.6095308	3.7454	0.0443	0.0086	0.0074	0.0014	0.0177	5.267827	1.1751	0.9520753
CV (%)	1.207708	1.1001	0.9619	0.4653	0.4664	0.5135	0.2131	2.474344	2.4547	2.209129
Pr	<.0001	0.0363	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001

Note: Means with the same letter are not significantly different at Pr > 0.05.

4.3 Relationship of mineral constituents of leaves of castor genotypes with eri silkworm rearing performance

The foliar mineral composition of castor genotypes resulted in significantly important inter-relationship with performance of eri silkworms when their leaves served as feeds. This relationship between leaf composition values and important eri silkworm traits have been worked out through correlation analysis and the results are summarized in table 3.

a) Nitrogen

It revealed significantly strong positive correlation with with larval weight (r= 0.63106), shell weight (r= 0.47607), silk ratio (r= 0.73177), survival (r= 0.72316), effective rate of rearing (r= 0.65269), hatching percent (r= 0.45918) and fecundity(r= 0.55043) of eri silkworms. However, its relationship (correlation) was positive to all silkworm characters though not statistically significant.

b) Phosphorus

Phosphorus content of leaves had shown significant positive correlation with larval weight (r= 0.42601), cocoon weight (r= 0.61922), pupal weight (r= 0.58567), shell weight (r= 0.74301), silk ratio (r= 0.82462), effective rate of rearing (r= 0.45853) and survival(r= 0.43577) of eri silkworms. However, it had shown non –significant correlation with hatching percent and fecundity.

c) Potassium, Calcium and Magnesium

Potassium, calcium and magnesium have been found to have no significant correlation with all eri silkworm rearing characteristics under study at $p < 0.05$.

Table 3: Relationship of minerals with eri silkworm rearing performance

Parameters	N	P	K	Ca	Mg
Larval weight	0.63106*	0.42601*	0.07933	-0.03916	0.1453
Cocoon weight	0.31697	0.61922*	0.12902	0.0411	0.09611
Pupal weight	0.27771	0.58567*	0.15593	0.06061	0.09277
Shell weight	0.47557*	0.74301*	0.00649	-0.04354	0.11713
Silk ratio	0.73177*	0.82462*	-0.31483	-0.26085	0.13115
Larval duration	0.25339	0.23824	-0.00715	-0.34519	0.25074
Survival rate	0.72316*	0.45853*	0.15063	0.05149	0.20033
ERR	0.65269*	0.43577*	0.2007	0.25273	0.23299
Hatching percent	0.45918*	-0.00512	0.07089	0.03107	0.13489
Fecundity	0.55043*	-0.02447	0.18255	0.1525	0.31684

* Significant at Pr $\leq$ 0.05

5. Discussion

It can be realized from the results of the present investigation that castor genotypes (Abaro, Acc 106584, Acc 203241, Acc 208624, Ar sel, Bako, GK sel and local check) showed wide variation in their qualitative traits with respect to minerals from such studies of the 1st type in Ethiopia. Consequently, since accumulation of nutrients in insect greatly influenced by the nutritional richness of the host plants, the mineral compositions of leaves of castor genotypes have been studied and they revealed very significant differences among castor genotypes. Similarly, studies on different castor genotypes have been conducted in abroad by several authors and they have found out significant differences among different genotypes (e.g. Jayaramaiah, Sannappa, 1998) [15, 28]. In addition, (Scriber and Slansky, 1981) emphasized the importance of nitrogen and phosphorus for silkworm rearing. Accordingly, nitrogen and phosphorus contents all together were comparatively higher in genotype genotype Abaro from this study, which recorded 2.30% and 4.125% respectively. The average nitrogen content obtained from this study was even greater than the findings of Jayaramaiah Sannappa (1998) [15, 28]. Who reported 2.4 to 3.0 % nitrogen from different castor genotypes?

In addition, the present study on rearing performance of eri silkworms conducted by feeding castor genotypes indicated very significant differences among genotypes. Among the genotypes, Abara has been found superior in special reference to cocoon traits followed by Acc 208624 and Bako. This genotype showed 3.344 g single cocoon weight, 0.484 g single shell weight and 14.487 % shell ratio, was the most promising castor genotype in respect to cocoon traits. The present finding is comparable to Thangavelu, Phukon (1983) [34]. and Patil *et al*. (1998 and 2009), who reported that variation in performance of eri silkworm with respect to cocoon traits is mainly due to host plant varieties and obtained maximum single cocoon weight, shell weight and shell ratio of 3.817g, 0.4433g and 11.63% respectively. Generally, Abaro provided highest cocoon weight, shell weight, pupal weight and silk ratio as well as ERR with medium and above medium record for hatching percent of eggs, larval weight, fecundity and survival to eri silkworms. However, local genotype recorded medium and below medium values for most rearing performance indicators.

Furthermore, the inter-relationship of performance of eri silkworms and the mineral composition of leaves of castor genotypes have been analyzed by correlation analysis through SAS software. The results suggest that different traits of eri silkworm have significantly different relationship with various biochemical constituents of castor leaves. As a result, cocoon traits such as cocoon weight, pupal weight, shell weight and shell ratio found to have significant positive relationship with nitrogen and phosphorus contents. In addition, larval characteristics like larval weight, survival and effective rate of rearing showed a significant positive correlation or interaction with nitrogen and phosphorus contents. Moreover, drainage parameters like hatching percent and fecundity showed significant positive correlation with nitrogen composition of castor leaves. In general, the relationship obtained from such traits with foliar composition parameters of nitrogen and phosphorus were in conformity with Jayaramaiah, Sannappa (1998) [15, 28]. Therefore, it is clearly established that the quality of leaves particularly their nitrogen and phosphorus composition are highly required for larval, cocoon and drainage characteristics of eri silkworms.

6. Conclusion and Recommendation

The present study reveals that the selection of castor genotypes for rearing eri silkworm based up on foliar mineral constituents of the castor genotypes as well as rearing performance is very important in order to get improvements in larval development, cocoon production and drainage parameters. The mineral composition of leaves has also revealed significant differences among castor genotypes. The relationship of foliar mineral constituents of castor genotypes with larval and cocoon parameters showed a significant positive correlation or interaction with nitrogen and phosphorus contents. In addition, drainage parameters showed significant positive correlation with nitrogen composition of castor leaves. Therefore, by considering all important parameters simultaneously, nitrogen and phosphorus contents can be established as the basic ones to characterize castor genotypes. As a result, consideration of high nitrogen and phosphorus levels will lead us to concentrate our investigation on Abaro and Acc 208624. In respect to rearing performance of eri silkworm and with special reference to cocoon or economic traits, genotype Abaro was the most promising followed by Acc 208624. Thus, it can be recommended for future research and development efforts. However, more research should also be carried out to support the current findings in consideration with detailed proximate compositions and field performances of castor genotypes and in relation feeding efficiency of eri silkworms when using these genotypes as feed sources.

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