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Association analysis of major nutrient and secondary nutrient status of leaves of selected castor genotypes and growth indices of eri silkworm

Dr. S. CHANDRASHEKHAR
Professor of Sericulture

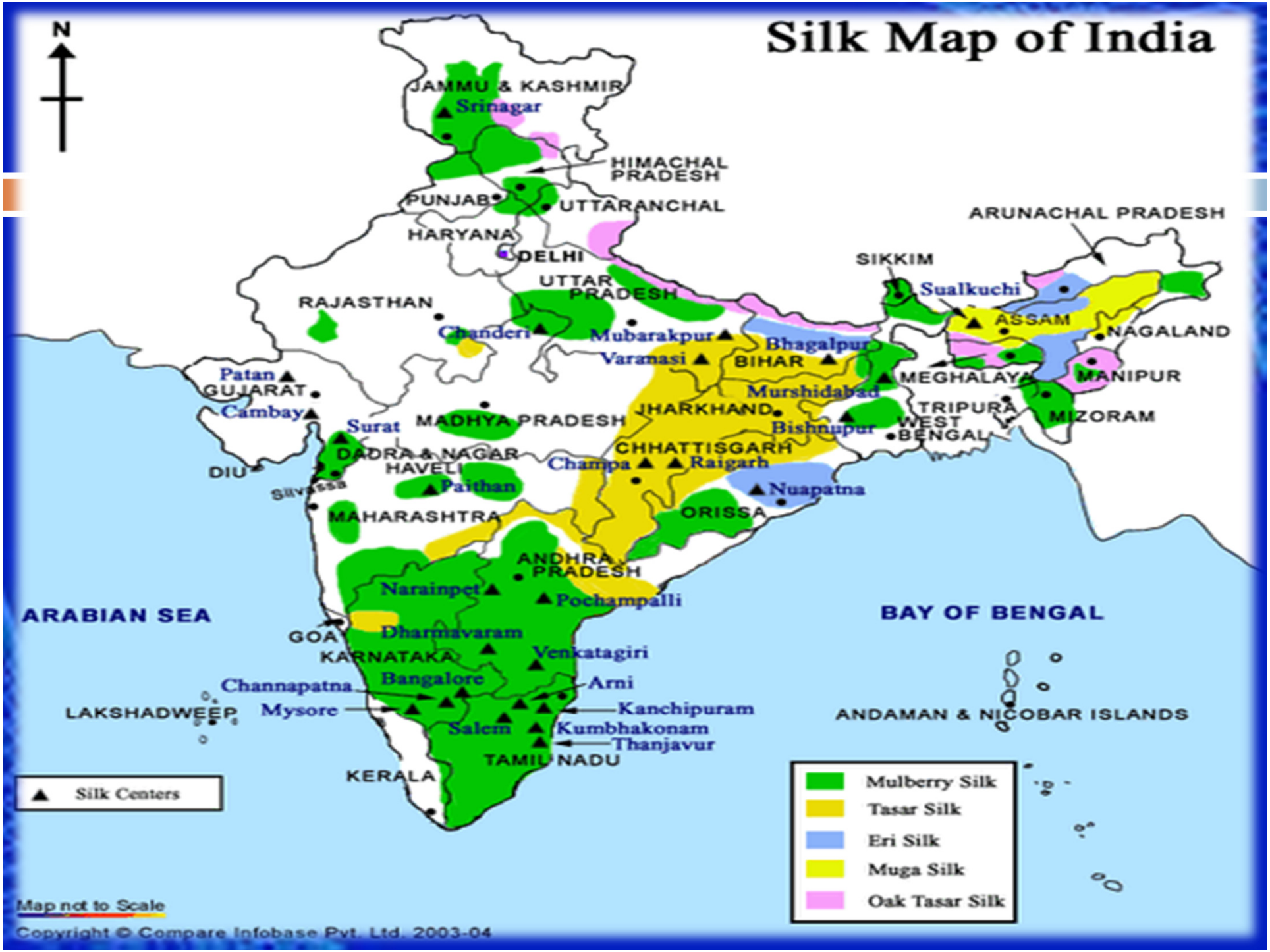
UNIVERSITY OF AGRICULTURAL SCIENCES
BENGALURU, INDIA.

CLASSIFICATION OF SERICULTURE

Based on Host Plants	**Mulberry**	Mulberry Silkworm
	Non-Mulberry	Eri Silkworm Tasar Silkworm Muga Silkworm
Based on Cultivation of Host Plants	**Agro-Based**	Mulberry Silkworm Eri Silkworm
	Forest Based	Tasar Silkworm Muga Silkworm

GLOBAL RAW SILK PRODUCTION - 2014

Country	MT		Country	MT
Brazil	560		India (16%)	28474
Bulgaria	8		Indonesia	10
China (82%)	146000		Iran	110
Colombia	0.5		Japan	30
Syria	0.5		Uzbekistan	1100
Thailand	692		Vietnam	420
Tunisia	4		Madagascar	15
Turkey	32		Total	177805


Silk Map of India
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JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
PUNJAB
UTTARANCHAL
HARYANA
DELHI
UTTAR PRADESH
RAJASTHAN
Chanderi
Mubarakpur
Varanasi
Bhagalpur
BIHAR
ARUNACHAL PRADESH
SIKKIM
Sualkuchi
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
Murshidabad
JHARKHAND
TRIPURA
MIZORAM
WEST BENGAL
Bishnupur
Patan
GUJARAT
Cambay
Surat
MADHYA PRADESH
DADRA & NAGAR HAVELI
DIU
Silvassa
CHHATTISGARH
Champa
Raigarh
Paithan
Nuapatna
MAHARASHTRA
ORISSA
ANDHRA PRADESH
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Venkatagiri
Channapatna
Bangalore
Arni
LAKSHADWEEP
Mysore
Kanchipuram
Salem
Kumbhakonam
Thanjavur
TAMIL NADU
KERALA
ANDAMAN & NICOBAR ISLANDS
Silk Centers
Mulberry Silk
Tasar Silk
Eri Silk
Muga Silk
Oak Tasar Silk
Map not to Scale
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RAW SILK PRODUCTION IN INDIA

Type of Silk	MT	%
Mulberry	21,272 MT	74.73%
Eri	4,633 MT	16.27%
Tasar	2,404 MT	8.44 %
Muga	158 MT	0.55%
Total	28,467	100

Mulberry Sericulture

Ericulture

Tasar Culture

Muga Culture

HOST PLANTS OF ERI SILKWORM

Primary	Castor, *Ricinus communis* & Kesseru, *Heteropanax fragrance*
Secondary	Tapioca, *Manihot utilissima* & Payam, *Evodia fraxinifolia*
Tertiary	Maharukh *Ailanthus excelsa*, Barkesseru *A. gladulosa* Gogul *Ailanthus grandis*, Guggul Dhup *Ailanthus tryphysa* Paypaya *Carica papaya*, Masuri *Coriaria nepalensis* Thebow *Hodgosonia heteroclita*, Safed Arandi *Jatropha curcus* Bhotera *Jatropha multifida*, Phutkoul *Micromelium pubescence* Golainchi *Plumeria acutifolia*, Korha *Sapium eugenifolium* Vilayati Shisham *Sapium sebiferum*, Tejbal *Xanthoxylum alatum* Badrang *Xanthoxylum rhesta*

- Castor is one of the ancient oilseed crops of the world. India accounts for nearly 65 % of the world's castor production.

- In India, castor is cultivated in about 6.28 lakh ha in the states of Andhra Pradesh, Orissa, Gujarat, Karnataka, Kerala, Tamil Nadu, Maharashtra, Madhya Pradesh, Rajasthan, Bihar, Uttar Pradesh, Punjab and West Bengal for oilseed production (7.62 lakh tonnes) only with a productivity of 1213 kg/ha.

- In Karnataka, Castor is cultivated in an area of 24,981 ha with a production and productivity of 25,989 MT and 1095 kg/ha, respectively.

- Tasar and muga silkworms mainly feed on leaves of forest trees, attempts to increase their production have certain drawbacks over ericulture.

- Ericulture in one acre of castor fetches a net income of Rs. 12,000 to 15,000/- per year, when entire foliage is used for silkworm rearing.

- It is known that 25 to 40 per cent of foliage from castor plantations can be utilized for eri silkworm rearing without affecting the seed production

- The quality of leaves provided to the worms for feeding has been considered as the prime factor influencing the production of good cocoon crop.

- There is a tremendous scope for ericulture in castor growing areas without affecting castor seed production which it provides additional returns for the poor, dry land cultivators and small and marginal farmers.

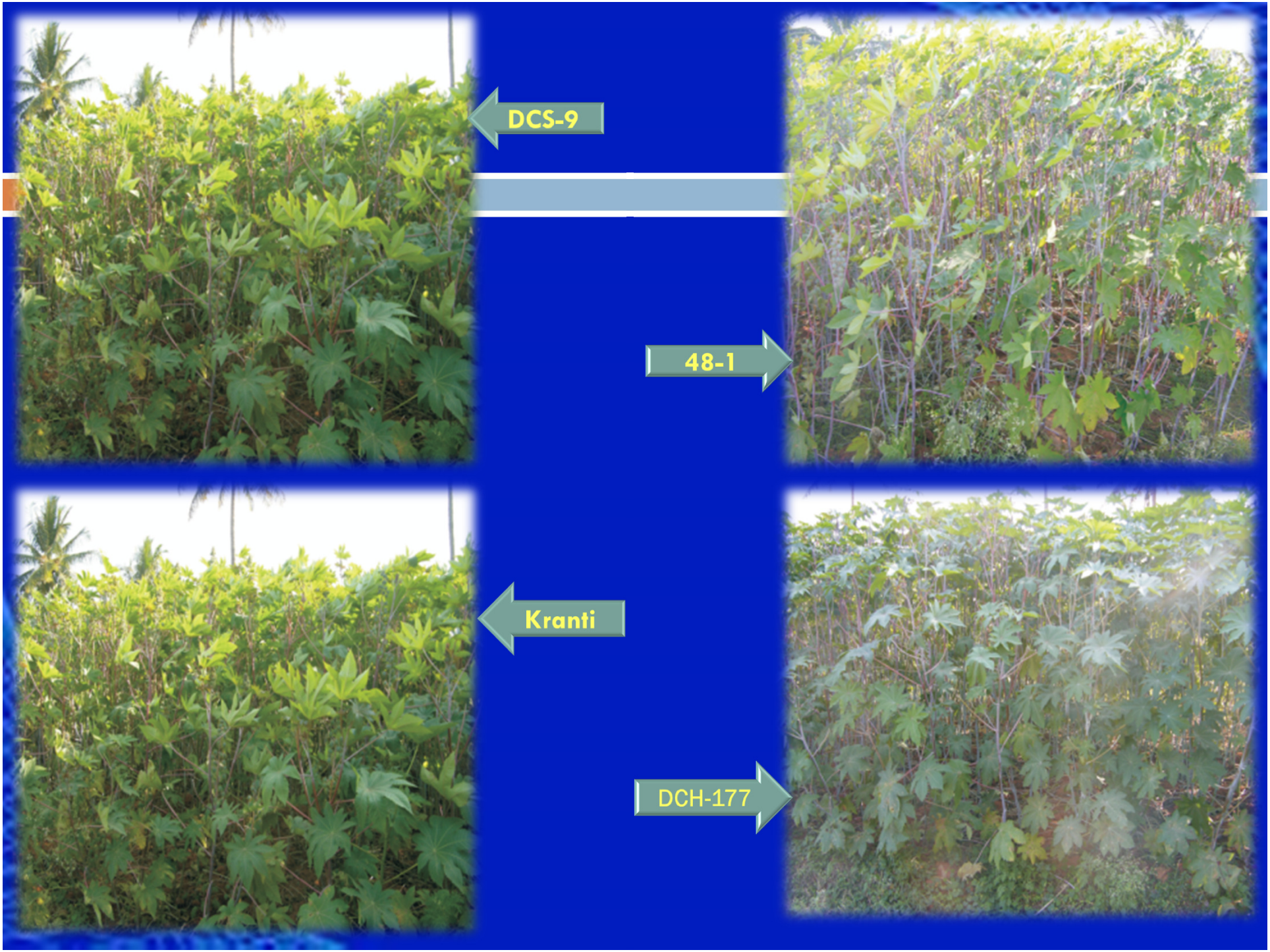
- Castor, a minor oilseed crop can be linked with ericulture to maximize the returns if right choice of the genotype of castor is made.

OBJECTIVES

- ✓ To study the major and secondary nutrient status of castor leaf in different genotypes.
- ✓ To know the relationship between foliar constituents of castor and growth indices of eri silkworm.

METHODOLOGY

1.	Castor genotypes	Eight elite castor hybrids / varieties
2.	Cultivation practices	Recommended package
3.	Observations	Major and secondary nutrients
4.	Statistical design	Randomized Complete Block Design
5.	Eri silkworm breed	White - plain
6.	Rearing practices	Recommended package
7.	Observations	Growth indices
8.	Statistical design	Complete Randomized Design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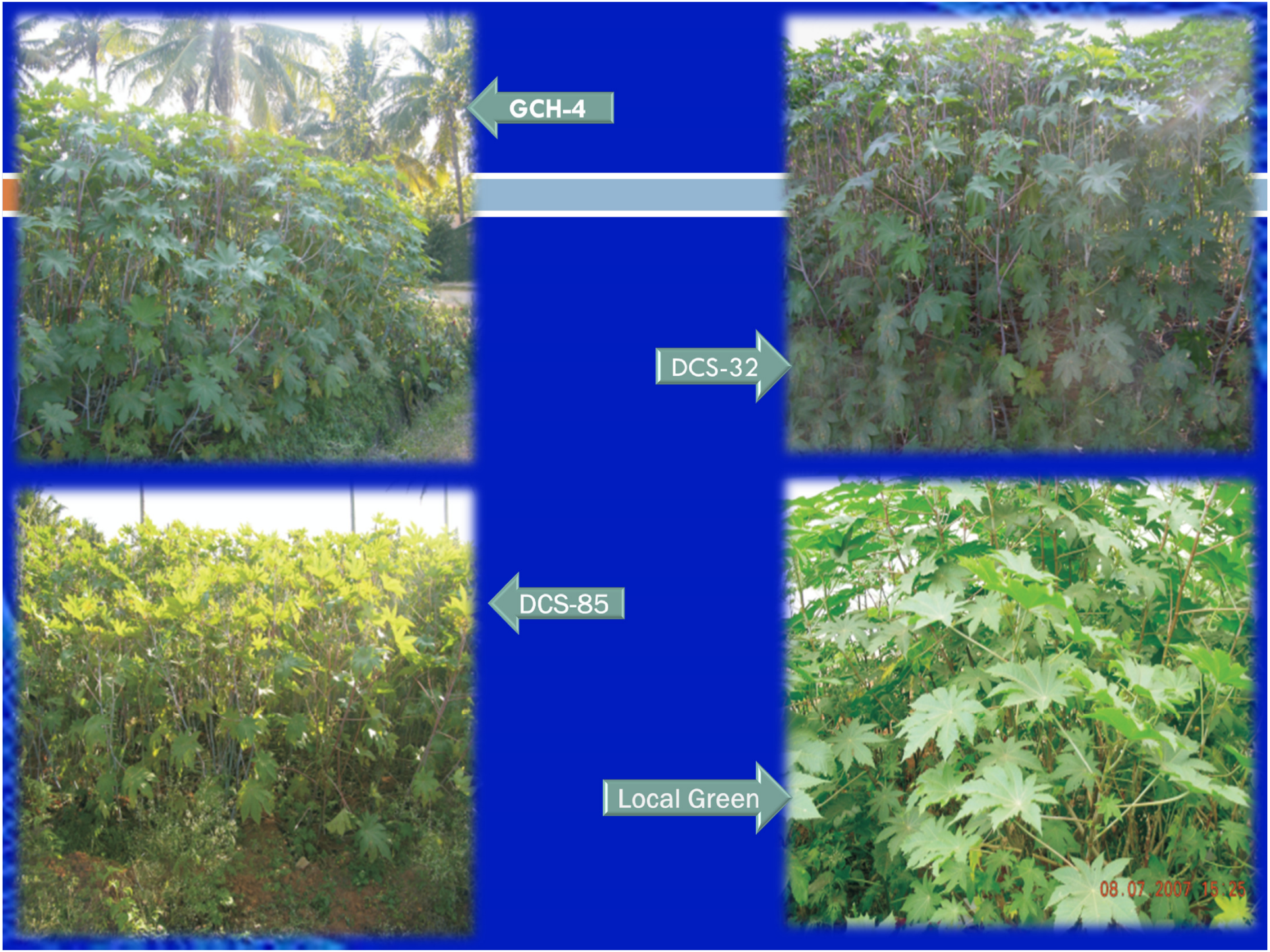
48-1
Kranti
DCH-177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Foliar analysis of castor leaf

- The leaf samples at three different heights of the plant *viz*., top, middle and bottom collected in paper bags.
- Composite leaf samples were made at 90 days after sowing.
- Leaves were shade dried for three days. Then dried in hot air oven at 70^{o}C until constant weight was obtained.
- The samples were ground into fine powder and preserved in butter paper bags.

Major Nutrients

Nitrogen: Estimated using 0.5g of sample and digested in conc. H_2SO_4 with K_2SO_4 + $CuSO_4$ + Se mixture in a Kjeldhal flask and distilled in an alkaline medium. The liberated ammonia was collected in 4% boric acid containing bromocresol green methyl red mixed indicator and titrated against standard H_2SO_4. From the data, the per cent nitrogen was calculated on oven dry weight basis (Jackson, 1973).

Phosphorus: Estimated by using digested extract by adding Vanadomolybdate method using HNO_3 medium. The colour intensity was measured using spectrophotometer at 420 nm (Jackson, 1973) and the phosphorus content was expressed in percentage on dry weight basis.

Potassium: Determined using the digested extract with the help of flame photometer and was expressed in percentage on dry weight basis (Jackson, 1973).

Secondary Nutrients

Calcium and Magnesium: In the digested extracts of castor leaf samples, calcium and magnesium were determined by titrating the aliquot against standard E.D.T.A. solution using suitable indicators as described by Jackson (1973) and the contents were expressed in percentage on dry weight basis.

Sulphur: Digested castor leaf samples was estimated by turbidometric method and expressed in percentage on dry weight basis (Jackson, 1973).

GROWTH INDICES OF ERI SILKWORM

- Larval weight index
- Larval duration index
- Pupal weight index
- Pupal duration index
- Larval – pupal duration index
- Cocoon weight index
- Silk index
- Eclosion index
- Oviposition index
- Hatching index
- Leaf – cocoon ratio
- Leaf – egg ratio
- Leaf – cocoon conversion rate
- Leaf – silk conversion rate
- Growth index:
  - % Pupation
  - % Moth emergence
- Net reproductive rate

STATISTICAL ANALYSIS

- **The correlation co-efficients ($p \leq 0.05$) were worked out to know the relationship between the foliar constituents of castor genotypes and growth indices of eri silkworm (Cochran and Cox, 2000).**


RESULTS

Correlation co-efficients

Major nutrients of castor leaf v/s Growth indices of eri silkworm

Source	Nitrogen	Phosphorus	Potassium
Larval weight index	0.6562	0.3641	0.2182
Larval duration index	-0.7030	-0.2606	-0.1662
Pupal weight index	0.2223	0.0642	0.1132
Pupal duration index	-0.5321	-0.1105	-0.0199
Larval – Pupal duration index	-0.6444	-0.2007	-0.1057
Cocoon weight index	0.6820	0.3570	0.2339
Silk index	0.7707*	0.4296	0.2742

* Significant at P ≤ 0.05

Correlation co-efficients

Major nutrients of castor leaf v/s Growth indices of eri silkworm

Source		Nitrogen	Phosphorus	Potassium
Eclosion index		0.4675	0.1835	0.0866
Oviposition index		0.7263*	0.2930	0.1345
Hatching index		0.0527	0.5209	0.5660
Leaf – Cocoon ratio		-0.5874	-0.1404	0.1025
Leaf – Egg ratio		0.6470	0.1802	-0.0487
Leaf – Cocoon conversion rate		0.5990	0.1845	-0.0476
Leaf – Silk conversion rate		0.7096*	0.3038	0.0942
Growth index:	% Pupation	0.7281*	0.3171	0.2028
	% Moth emergence	0.6231	0.2092	0.1102
Net reproductive rate		0.7386*	0.3467	0.1988

* Significant at P ≤ 0.05

Correlation co-efficients

Secondary nutrients of castor leaf v/s Growth indices of eri silkworm

Source	Calcium	Magnesium	Sulphur
Larval weight index	0.8969*	-0.2964	0.4995
Larval duration index	-0.9405*	-0.0258	-0.3388
Pupal weight index	0.4610	-0.2148	0.1826
Pupal duration index	-0.9293*	-0.0415	-0.2902
Larval – Pupal duration index	-0.9579*	-0.0334	-0.3255
Cocoon weight index	0.9548*	-0.2356	0.4852
Silk index	0.9688*	-0.2333	0.5274

* Significant at $P \leq 0.05$

Correlation co-efficients

Secondary nutrients of castor leaf v/s Growth indices of eri silkworm

Source		Calcium	Magnesium	Sulphur
Eclosion index		0.8936*	-0.0155	0.3683
Oviposition index		0.9425*	-0.1553	0.4131
Hatching index		0.0772	-0.7906	0.4597
Leaf – Cocoon ratio		0.8408*	0.0536	-0.3627
Leaf – Egg ratio		0.8672*	-0.0765	0.3536
Leaf – Cocoon conversion rate		0.8521*	-0.0996	0.3828
Leaf – Silk conversion rate		0.9323*	-0.1684	0.4616
Growth index:	% Pupation	0.9815*	-0.0864	0.4222
	% Moth emergence	0.9609*	-0.0024	0.3465
Net reproductive rate		0.9492*	-0.1992	0.4473

* Significant at P ≤ 0.05

OUTCOME OF THE STUDY

- The foliar constituents of castor genotypes like major and secondary nutrients had marginal variations among them.
- Growth indices of eri silkworm also showed differences among various castor genotypes.
- Foliar constituents of castor genotypes could establish positive correlation with growth indices of eri silkworm.


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