

BIOSYSTEMATIC STUDIES OF CUCURBITACEAE IN MAINPURI DISTRICT OF U.P.

Akhilesh Singh Chauhan

Department of Botany, School of Life Sciences,
Dr. B.R. Ambedkar University, Khandari Campus, Agra - 282 002 (India)

(Received: October 18, 2005; Accepted: November 28, 2005)

ABSTRACT

The biosystematic studies of seeds on cultivated crops of family Cucurbitaceae in different areas of Mainpuri district of Uttar Pradesh. The Rm values of isoesterase and peroxidase are discussed in different species of Cucurbitaceae in Mainpuri district of U.P. Rm values of *Cucurbita* species showed a great differentiation of isoesterase and peroxidase has 4 bands, whenever 6-8 bands have esterase pattern, *Cucurbita pepo* and *Cucurbita moschata* have high intense while *Cucumis memordica* and *Cucumis melo* have low intense whenever *Cucumis sativus* have moderate intense. *Luffa cylindrica* and *Luffa acutangula* have 5 bands, *Luffa acutangula* is high intense from *Luffa cylindrica*. *Lagenaria* species (Long, Kamandal and been lauki) have been carried out that been and kamandal lauki have great intense from long lauki. *Citrullus vulgaris* and *Citrullus fistulosus* have low intensive seen with high Rm value. *Coccinia* species and *Trichosanthes* species have high intensive and 5 to 7 bands are present in these species.

Key words: Biosystematical studies, Cucurbitaceae, Rm values, isoesterase, peroxidase)

INTRODUCTION

Cultivated Cucurbitaceae find their most important use as food in present days. Due to their presence of some nutrients like carbohydrates, oils, proteins, vitamins in fruit as well in seed. Biochemical studies and their composition reviewed by chemical composition of seeds. The amount of seed coat per seed varies from 18% in *Cucurbita pepo* and 1-60% in *Lagenaria siceraria*. Amount of oils and proteins in decorticated seeds are some what less varied and contains by weight 49.5+2.3% oil and 35+2.4% protein¹. Cucurbits seeds are important sources of edible oils². Decorticated seeds contains 35% protein as globulins and albumins. Biochemically, oil seed globulins are storage proteins while albumins are believed to be metabolic proteins. Study of *Cucumis sativus*, albumin showed about one-fourth of its protein is water soluble and has low mol. wt.

Globulin contain 70-90% of total protein, 18% nitrogen are soluble in 10% salt solution in cucurbit seeds. Seeds had protein and purified globulin indicate oilseeds are rich in glutamic acid, arginine and aspartic acid, cellulosic cell wall material and compose the bulk of carbohydrate in cucurbit seeds.

Isozyme analyses for most plants are usually simple descriptive surveys. The isozyme techniques in *Cucurbita* species were of esterase isozymes³ and two surveys of peroxidase variation. *Cucurbita* species had both esterase and leucine amino peptidase (*Wall a Whitaker 1971*)⁴ and examined the genetic character.

The uses of isozyme phenotypes to help the establish the synonymy of *Cucurbita* (*Robinson Pachalski, 1980*)⁵. *Cucurbita maxima* and *Cucurbita moschata* obtained isozyme evidence for affinity (*Decker, 1986*)⁶. *Cucumis melo*, *Cucumis*

trigonus and *Cucumis callosis* had the same isozymes characteristics of *Cucumis melo* and *Cucumis trigonus* (Jefferey. 1979)⁷. *Cucurbita moschata* is included in this isozyme group because it had isozyme bands in common with other species, although its electrophoretic pattern was distinctive. *Cucurbita maxima*, and *Cucumis moschata* are somewhat similar in morphology and distinguished than an hybrids are mostly self sterile. *Cucurbita maxima* had different isozyme phenotypes for each of 12 enzyme and segregation for isozymes loci was detected in progeny of inter specific hybrid. *Cucumis sativus* is so different from other *Cucumis* species in chromosome number, center of origin and other respect, *Cucumis sativus* can be distinguished by its enzyme from all other Cucurbitaceae genera.

MATERIALS AND METHODS

The iso esterases and iso-peroxidases were studied in family-Cucurbitaceae of the pollination stages. Extraction of isoenzymes, the stigma of nature flower where crushed in chilled phosphate buffer maintained at pH 7.3, were carried out over night in cold and kept in refrigerator.

Preparation of reagents

Ammonium per sulphate (1.5%) was prepared by dissolving it (150 mg) in water (10 ml) then unstable solution been reported that a 10% solution is usable for upto 2 weeks if stored under refrigerator. Temed was used directly and stable when kept at 4°C in dark bottle. Gel buffer (sodium phosphate) was prepared in dissolving sodium hydrogen phosphate (810 gm) and 59.3 gm of sodium hydrogen phosphate ($\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$) in water (1 litre) at pH 7.2 (R.T.). The electrode buffer (Tris glycine) was prepared with dissolving this (6 gm) and glycine (28.8 gm) then dilute 1 litre with water, pH 8.3. The separation of isozymes were achieved on polyacrylamide gel (7.5%) using tris glycine (pH 8.3) as the electrode buffer.

Staining of isozymes

Esterases were stained with naphthyl acetate (0.006 M), blue RR/100 ml (200 mg) and tris (0.08 M) at pH 7.0. Peroxidases were stained with a mixture of benzidine (0.0024 M), ethyl alcohol (50%) and hydrogen peroxide (1%). Hydrogen

peroxide (3%)/100 ml staining mixture of 33 ml, acetic acid (5%), and water (100 ml) for 1 hr and washed in ethyl alcohol (70%) for 30 minute.

Observations

In biosystematic studies, the isoesterase and peroxidase are undertaken, in germplasm of cucurbits seeds. The description of Rm values of isoesterases and Rm values of peroxidase of Cucurbitaceae in Mainpuri district of UP are given in following paragraphs.

1. Cucurbita species

(a) *Cucurbita pepo*:

There are 8 bands of isoesterase, first 3 bands are low instance with 0.08, 0.17 and 0.28 Rm values, moderates of 2 band with 0.64 and 0.69 Rm value and last 3 band are high intensives with 0.78, 0.86 and 0.96 Rm values. Whenever 4 bands have shown in peroxidase spectrum, low intense has 0.18, moderate has 0.73 and other two high intense have 0.58 and 0.69 Rm values.

(b) *Cucurbita moschata*:

It has shown 0.29 and 0.45 Rm values of low intense, 0.89 of moderate intense, 0.79, 0.82 and 0.85 Rm of high intensives. Through isoesterases pattern while 0.19 of low intense, 0.71 and 0.80 of moderate intense and 0.42 of high intense in peroxidase pattern.

(c) *Cucurbita maxima*:

It shown 2 low intense with 0.30 and 0.69 Rm values, 2 moderate with 0.79 and 0.83 Rm values and high with 0.93 Rm values in esterase pattern. In peroxidase pattern Rm values of low intense in 0.69, moderate 0.25, 0.60 and high intense 0.30 Rm values.

2. Cucumis species

(a) *Cucumis melo*:

There are 6 band of isoesterases, 2 bands are moderate intense with 0.13 and 0.20 Rm value, low intense of 2 bands with 0.29 and 0.79 Rm value and last band is high intense with 0.88 Rm values.

(b) *Cucumis sativus*: There are 7 band of isoesterase, 0.30 and 0.91 at low intense and 0.80 Rm values of high intense. Moderate intensives have shown 4 bands with 0.57, 0.62, 0.70 and 0.82 Rm values.

(c) *Cucumis momordica*:

It has 0.79 and 0.70 Rm values of low intensives, 0.81 and 0.87 Rm values of moderate

and 0.70 Rm values of high intense.

3. *Luffa* species

(a) *Luffa cylindrica*:

There are 5 bands of isoesterases, first 2 banded on moderate intense with 0.27 and 0.36 Rm values. Two banded in middle have shown high intensities with 0.46 and 0.76 Rm values, last band is low intense with 0.90 Rm values.

(b) *Luffa acutangula*:

In *Luffa acutangula*, 0.89 is low intense., 0.80 and 0.31 Rm values is moderate and 0.06 and 0.64 Rm values of high intense.

4. *Lageneria siceraia*:

There are three type sample like as long lauki, kamadal and been lauki, observed through iso esterase pattern.

(a) *Long lauki*:

It shown first two band of low intensities with 0.33 and 0.50 Rm values, last two band of moderate intense with 0.77 and 0.86 Rm values and middle band show high intensity with 0.56 Rm values.

(b) *Kamandal lauki*:

It has 0.11 Rm values of intensity and 0.41 of high intensity band, other 3 band show moderate with 0.36, 0.67 and 0.84 Rm values.

(c) *Been lauki*:

It has shown 7 handed, 3 bands of low intensity with 0.05, 0.87 and 0.92 Rm values. Two band of moderate intense with 0.55 and 0.81 Rm values, other 2 bands of high intensities with 0.33 and 0.39 Rm values.

5. *Citrullus* species

(a) *Citrullus vulgaris*:

It have 5 band of isoesterases, first 2 bands are shown high intense with 0.12 and 0.21 Rm values. Two middle bands are low intense with 0.48 and 0.78 Rm values and last band shown moderate intense with 0.90 Rm values.

(b) *Citrullus fistulosus*:

There are 7 bands are shown out of them 3 are of low intense with 0.19, 0.75 and 0.84 Rm values, 2 moderate intense with 0.49 and 0.69 Rm values and 0.07 and 0.42 Rm values are in high intense.

6. *Coccinia* species

In *Coccinia* species, 0.16 and 0.55 is low intense, 0.72 and 0.34 is moderate intense and 0.77, 0.82 and 0.91 Rm values in high intense.

7. *Trichosanthes* species

(a) *Trichosanthes anguina*:

In this species, first band shown low intense with 0.09 Rm values, last 2 bands show moderate with 0.39 and 0.79 Rm values. In middle, 2 bands show high intense with 0.28 and 0.34 Rm values.

(b) *Trichosanthes cucumeriana*:

There are 7 bands of isoesterases are shown, 2 low intense with 0.44 and 0.84 Rm values, 2 moderate intense with 0.15 and 0.66 Rm values and 3 high intense with 0.23, 0.32 and 0.72 Rm values.

RESULTS AND DISCUSSION

The biosystematical study has been conducted on the characteristics and properties of cucurbits seed oil and protein particularly of wild xerophytic cucurbits (*Scherent & Benj, 1986⁸, Hinman 1984⁹*). The carbohydrate rich flesh of the fruits is common article of commerce, seed yields of cucurbits seldom have been noted, even within a species, however, wild cucurbits growing in desert areas, yields of 500 to 3000 pound of seeds per acre for commercial oil seeds. (Curtis, 1964¹⁰ and Shahani 1951)¹¹.

Many chemical and physiochemical studies of cucurbitin have been conducted and mol. wt. of oligomeric heterogeneity, have been studied (*Jacks, 1986², Jacks et al. 1972¹*). From amino acid composition, evaluation of nutritional potentials of cucurbits meals and globulins were cultivated according to FAO/WHO standard through FAO/WHO Expert Group 1965, cucurbit seeds are deficient in lysine and sulphur containing amino acids (*Jacks 1986²*). Several amino acids were identified and characterized as constituent of cucurbit species. Citrulline acquired its trival name of watermelon.

Chromatography is used to reveal the amino acids present in plant extract. In the survey of some cucurbits (*Dunnill. and Fowden 1965¹²*) about 20 unknown compounds were recognized. Much information has accumulated on the native of long chain fatty acids in seed oils of Cucurbitaceae. *Bemis et al.* (1967¹³ and Hilditch & Williams 1964¹⁴) have discussed that may cucurbit seed oils have ordinary components to acids and amounts of each are in normal range.

In biochemical studies the isozymes studied of various cucurbits through isoesterase and peroxidase methods. Rm values of *Cucurbita* species has shown a great differentiation rough isoesterase and peroxidase pattern. In peroxidase pattern have 4 bands whenever 6 to 8 bands have been esterase pattern. *Cucurbita pepo* and *Cucurbita moschata* have seen high intense. In *Cucumis* species *Cucumis melo* and *Cucumis momordica* have low intense whenever *Cucumis sativus* has moderate intense. *Luffa cylindrica* and *Luffa acutangula* both have seen 5 bands, *Luffa actangula* is high intensive from *Luffa cylindrica*.

Four types of *Lagenaria* cultivated in Mainpuri district, three type of *Lagenaria* (Long, Kamandal and Been lauki) have been studied. Been and Kamandal lauki have great intensive from long as a wild variety. In *Citrullus vulgaris* and *Citrullus fistulosus* have low intensive seen with high Rm values. While high and moderate intense with minimum Rm values. *Coccinia* species, *Trichosanthes anguina* and *Trichosanthes cucumerina* have high intensive like as a wild variety, five to seven bands are present in their species. In *Coccinia*, 3 bands of high intense with 0.77, 0.82 and 0.91 Rm values.

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