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NUTRITIONAL AND ENVIRONMENTAL ASPECT OF COWPEA [*Vigna unguiculata* (L.) Walp.]

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ABSTRACT:
Cowpea (Vigna unguiculata [L .] Walp.) belongs to family Fabaceae It is one of the most important pulse crops in India. There are about twenty two varieties of Cowpea have been recommended for different states and union territory. It is valued immensely as food and fodder for it's role in biological nitrogen fixation. Induced mutagenesis may brings about changes in the overall morphology of plants and also increase in biochemical nature like carbohydrates, proteins, fats, vitamins and minerals. Cowpea is an important grain legume throughout the tropics and subtropics. It is cultivated as intercrop with maize, sorghum, millet.

Key Words: Cowpea, Legumes, Nitrogen fixation .

INTRODUCTION:

Pulses are one of the important segments of Indian agriculture after cereals and oil seeds. These pulses constitute chickpea, pigeon pea, lentil, mungbean, urdbean, field pea, grass pea, cowpea, common bean and horse gram. The split grains of these pulses are known as *dal* are excellent source of high quality protein, amino acids, fatty acids, fibers, minerals and vitamins. Pulses are less preferred by farmers because of high risk and less remunerative than cereals. The pulses are belongs the family **Leguminoceae** or **Fabaceae**. This member of family includes the economically important legume that is pulses, oil seed crops, forage and fodder crops, shrubs and tropical or subtropical trees. Pulses received about 80% of its nitrogen requirement from symbiotic nitrogen fixation from air thus these crops improve soil fertility by enriching nitrogen status,long term fertility and sustainability of the cropping systems. (Vision 2030 IIPR, Kanpur 2011)

The Cowpea Cowpea [*Vigna unguiculata* (L.) Walp] (2n=22) belonging to family Fabaceae. Cowpea is one of the oldest sources of human food. It is known by number of common names *crowdel pea, black eyed pea, southern pea* and internationally as *lobia*. The habit of Cowpea is erect, semi erect, prostrate or climbing type. Cowpea is tap rooted annual legume. Trifoliate leaves are develops alternately which are smooth, dull to shiny and pubescent. Flowers are born in multiple racemes are purple colored contribute to the attraction of insects. Cowpea is self pollinating type.

ORIGIN AND HISTORY OF COWPEA

The Cowpea has been recognized as of African origin Kumar D. and Mahla H.R. (2004), that distribution of wild forms covers much of the tropical Africa,where as the greater part of the variability within the wild species confined to South Africa .

Cowpea is an important versatile food legume. It is cultivated in tropic and subtropics region of Asia, Africa, Central and southern America. Part of southern Europe and USA Sangwan R.S.(2004*)* . Cowpea growing countries in the Asian region are India, Shrilanka ,Bangladesh,Myanmar,China, Korea,Thiland, Indonesia ,Nepal, Pakistan, Philippines and Malaysia. Food and agriculture organization (FAO) estimated that nearly 4 million metric tons of dry Cowpea grains produced about 10 million. In India Cowpea is cultivated all over the country. However western, central and peninsular regions are the prominent areas of Cowpea cultivation. In northern India the states like Rajasthan, Gujarat, U.P, Haryana, Punjab, and part of Himachal Pradesh are main Cowpea growing zones.

NUTRITIONAL ASPECTS IN COWPEA

Cowpea is considered as poor man's food. It is nutritionally cultivated in India for food, fodder, green manure and cover crop. Cowpea is low in fat, and high in fibre content. They contain about 54.5% carbohydrates, 24.1% protein, vitamin C, calcium, iron, phosphorus and ascorbic acid providing good nutritional quality.

Cowpea seed is nutritious component in the human diet, and cheap livestock feed. Cowpea grown to maturity can be used as feed, fodder or its pods can be harvested and eaten as a vegetable. Tender green leaves are used as vegetable. It may be used as green or dry fodder. The incorporation of Cowpea organic manure

into the soil leads to improvement in soil structure, water infiltration rate and water holding capacity of soil. Organic matter provided by this legume is quickly decomposed by soil microorganisms and does not persist It is also used as green manure, a nitrogen fixing crop or for erosion control. As Cowpea hey and fodder are used in southeastern united states and in other parts of world hence known as Cowpea .Cowpea is important component of farming system because of ability to restore soil fertility .

MATERIALS AND METHODS :

SELECTION OF EXPERIMENTAL SEED MATERIAL:

The experimental seed material of cowpea (*Vigna unguiculata* [L.] Walp). Variety - Phule Pandhari (PCP-9708) was collected from pulse and oil seed research Station, Pandharpur, District - Solapur.

MUTAGENS USED:

Physical mutagen - Gamma Rays

The experimental seeds were packed and irradiated with 20 kR, 30 kR, 40 kR and 50 kR obtained from source Co60.

Chemical mutagen - Ethyl Methane Sulphonate (EMS)

Dry and healthy seeds were treated with EMS at the concentration of 0.050%, 0.075%, 0.10%, and 0.125%. Combination of both Gamma Rays and EMS as 20 kR + 0.050%, 30 kR + 0.075%, 40 kR + 0.10% and 50 kR + 0.125% are also used.

Seeds of each treatment along with control were sown in research field by complete Randomize Block Design (RBD) with three replications and result was recorded

RESULT & DISCUSSION :

i) Leaf protein content

The leaf protein seed protein content in the present studies has revealed an enhancement in majority of the M_4 generation. The viable mutants have developed through the EMS, gamma rays and combination treatments.

The estimated sample of leaf protein content in the control was 4.52%. The leaf protein content in mutants showed increasing in values as compared to control. The average of leaf protein content of ten different mutants was found from 3.40% to 9.00%.The highest leaf protein content 9.00% was observed in luxuriant mutant and the lowest leaf protein content 3.40% was observed in early flowering mutant. The dwarf mutant shows 7.40% of leaf protein content next to the luxuriant mutant.

ii) Seed protein content:

The seed protein content in majority of the mutants showed increasing values as compared to control. The seed protein content in the control 5.19% was observed. The highest seed protein content 8.42 % in tall mutant and 8.41% in divergently branched mutant lowest seed protein content 4.71% was observed in branched mutant. The average of seed protein content of ten different mutants was found from 4.71% to 8.42 %.

iii)Total Carbohydrates content

Total carbohydrates content in viable mutants of Cowpea ranges from 1.79% to 5.58%. In control plant 2.33% total carbohydrate was found.The highest 5.58% total carbohydrates was observed in dwarf mutant and lowest 1.79% total carbohydrates content was found in branched mutant. Total carbohydrates content in morphological viable mutants of Cowpea ranges from 1.79% to 5.58 %.

Table No.: 3 Chlorophyll content

Total chlorophyll content in leaves of the morphological mutants of Cowpea. It was ranged from 1.1628 mg/gm to 2.6018 mg/gm. The total chlorophyll content in leaves particular in Chl 'a' and Chl 'b' shows the fluctuations.

The sample of control plant shows 1.2960 mg**/**gm of total chlorophyll. The highest 2.6018/gm. amount of total chlorophyll content was observed in dark green leaves mutant the lowest 1.1628mg/gm**.** amount of total chlorophyll content was found in divergently branched mutant**.** Total chlorophyll content in morphological mutant of Cowpea was ranged

from 1.1628 mg/gm to 2.6018 mg/gm. In chlorophyll'a' and chlorophyll 'b' was observed in the fluctuations. The fluctuation in chlorophyll pigments shows direct effect on physiology of plants.

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Table No. 1.: Nutritional composition of Cowpea seeds

Constituents (per 100g edible portion)	Content
Energy (kcl)	323
Protein (g)	24.1
Fat (g)	1.0
Carbohydrate (g)	10.8
Thiamine (mg)	0.51
Riboflavin (mg)	0.20
Niacin (mg)	1.3
Calcium (mg)	77.0
Phosphorus (mg)	414.0
Iron (mg)	8.6

Source: Tewari Pratibha *et al.* Cowpea in India (2004).

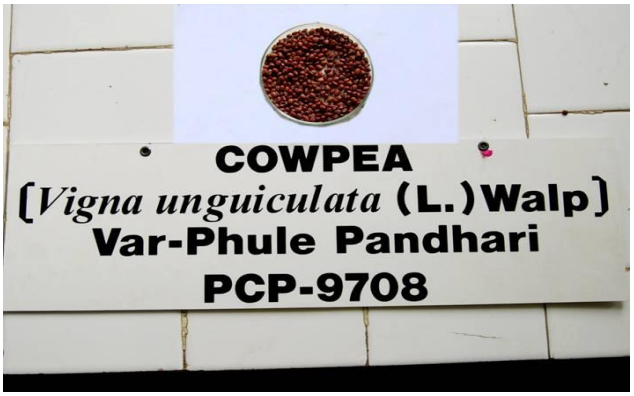

Plate 1: Experimental Material

Morphological Mutants	Seed protein content %	Leaf protein content %	Carbohydrates content %
Control	22.19	4.52	2.33
Robust Mutant	25.44	7.40	2.44
Branched Mutant	24.71	4.36	1.79
Dark Green Mutant	25.10	6.56	2.09
Early flowering Mutant	24.67	3.40	2.08
Late flowering Mutant	26.45	4.44	2.13
Tall Mutant	25.11	5.44	4.02
Dwarf Mutant	22.83	4.92	5.58
Bold seeded Mutant	23.86	5.20	3.42
Luxuriant Mutant	27.46	9.00	3.03
Divergently Branched Mutant	23.01	4.12	2.53

Table No.: 2 Protein and Carbohydrates content

Morphological mutants	**Chlorophyll 'a' mg/gm**	**Chlorophyll 'b' mg/gm**	**Total Chlorophyll mg/gm**
Control	0.6052	1.0960	1.2960
Robust mutant	0.9668	1.7524	2.1921
Branched mutant	0.7029	1.2722	1.4636
Dark green mutant	1.0767	1.9539	2.6018
Early flowering mutant	0.6458	1.1690	1.3433
Late flowering mutant	0.6568	1.1887	1.3571
Tall mutant	0.8795	1.5949	2.0519
Dwarf mutant	0.6235	1.1298	1.3866
Bold and large seeded mutant	0.6720	1.2176	1.4858
Luxuriant mutants mutant	1.0772	1.9523	1.9876
Divergently branched mutant	0.5370	0.9725	1.1628