SUMMARY

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Clitoria ternatea L. commonly known as "butterfly pea" is an important leguminous plant belongs to the family 'Fabaceae'. Fabaceae comprises of one of the world's most productive forage species and is widely distributed in tropical and temparate climates. Among legumes *C.ternatea* is one of the important forage plant. Particularly for ruminant animals. It is found to be easily palatable for livestock and it has been proved to be good quality ration for sheep.

It is a pretty ever green and perennial vine with attractive blue and white flowers. It has an ornamental value. The plant which is fairly drought resistant and is widely accepted as pasture, covercrop and also as a green manure throughout the world. It is also found to be active fixer of nitrogen and dry matter yield is high and consistant over years than those from cowpea, soybean and groundnut.

C.ternatea is also predominantly important medicinal plant. Every part of this plant one or other way is used as medicine for different disorders. The blue corolla yields blue dye which is used for colouring boiled rice in Amboyana due to its natural, stability and non-toxicity. It is also used to colouring mats in Malaysia and its tender pods are used as vegetable in Srilanka.

A persual of the related literature clearly reveale that despite its multiple uses, *C.ternatea* has received rather scant attention. Except some cytological information, induced mutational information is scanty. Hence, studies were planned to bring forth genetic improvement of the plant though the modern method like mutation which would help to evolve desirable plant types carry beneficial alterations with reference to yield traits, forage potential, level of protein and horticultural characters.

The material *C.ternatea* var blue solitary flower was collected from the germ plasm maintained in the Experimental Garden of P. G. Department of studies in Botany Karnatak University Dharwad, India. For the induction of mutations mutagens EMS and MH with different concentrations and durations of treatment were employed. For the mutation programme the entire study was spread over 3 generations. Studies in the M_1 generation included collection of data on the following parameters: seed germination percentage, seedling growth, survival of plant at maturity, morphological and chlorophyll varients in the leaves, the mitotic, meiotic and pollen fertility .

The observation on mutagenic effect in M_1 generation revealed an adverse effect on seedling growth, fertility and survivility. In general, there was concentration and time dependent reduction in germination, seedling growth and

increase in mitotic, meiotic abnormalities and sterility. Though, seed germination was affected, the treatment of EMS at lowest concentration for 12 hrs duration germination was enhanced. Moreover, stimulation of germination was recorded in shorter duration of EMS and MH treatments and medium durations of MH treatments. Whereas, in chronic treatment of both mutagens germinations were delayed.

Though seedling growth was adversly affected at higher concentrations of mutagens, both root and shoot growth enhanced at lowest concentration of MH for 6 hrs duration of treatment. Whereas, increased shoot growth was observed only at lowest and medium concentration of EMS in the same treatment duration.

Different types of mitotic and meiotic abnormalities could be seen after the mutagen treatment. They comprised of stikiness, precocious movement of chromosomes, bridge formation, fragments and also multivalent formation and micronuclei in meiotic phases. The frequency of abnormalities with MH treated population, exhibited concentration dependent decrease in abnormalities.

The level of fertility was also decreased as the concentration of mutagen increased in a given treatment dura tion. However, treatment of MH for 12 and 24 hrs did not follow such trend. Although, certain amount of sterility was

noticed in MH treated population in many concentrations of the treatment, the seed production was improved in relation to control.

Number of plants survived at maturity was affected. However, treatment of MH in medium concentration for 12 and 24 hrs durations plant survivility was severely affected, whereas, treatment of MH at highest concentration for all durations none of the plants survived. However, survivility was not much affected in EMS treatment like that of MH.

The chlorophyll deficient sectors in the leaflets were of different types such as, yellow (xantha), white (albina), yellowish green (chlorina) and light green (viridis) were recorded. These sectors were found at the apex or on the margin of leaflets on entire lamina. It was found that, EMS succesaed in producing higher number of sectorial plants than MH.

In the M_2 generation, wide spectrum of chlorophyll mutations like Albina, Xantha, Chlorina, Virescense, Maculata and other types could be detected . Their frequency did not follow any trend. However, the Xantha mutants were maximum in number among the treatments. But, no spectrum of chlorophyll was seen in MH treatment of M_2 generation. The frequency of Chlorophyll mutations declined in M_3 generation of EMS treatment, whereas, no chlorophyll mutants were detected

in MH treatment. The number of Xantha mutants in M_3 generation were maximum like M_2 generation among the treatments. Maculata type of mutations were not recorded even in EMS treated population of M_3 generation.

The critical observation of M_2 population of EMS treatment showed the presence of broad spectrum of morphological,viable mutants having desirable characters. Different types of viable mutants such as,erect, bushy, high, sparsely branched, bifurcately branched, stem faciation, dwarf, early, late flowering, small leaf changes in leaf shape, sterile, flower colour and seed coat colour mutants were obtained.

Broad spectrum of viable mutations were recorded in EMS treated population compared to MH treatments. The treatments of EMS at medium concentration of 24 hrs produced maximum viable mutations whereas, it was at lowest concentration of MH for 6 hrs duration showed maximum mutations. Similarly, production of highly branched mutants were maximum in MH treatments howerver, frequency of viable mutations were less compared to EMS treatments.

In M_3 generation, an increase in the frequency of viable mutations could be noted at majority of the mutagen treatments. The relative percentage of different viable mutants were random in both M_2 and M_3 generations. Viable

mutations though, observed in both mutagen their, frequency was high in EMS than MH treated population. Unlike chlorophyll mutation, viable mutation frequency was increased in M_3 generation compared to M_2 generation.

The data obtained from chlorophyll and viable mutations and datas on biological damage in M_1 generation the relative effectiveness and efficiency of the two mutagen varied according to the M_1 parameters taken for calculation. The numerical values of effectiveness gradually decreased with increase in a given duration of treatments. The treatment of EMS at medium concentration and longest duration, value of effectiveness was higher than lowest and highest concentration in M_3 generation whereas, treatments of EMS at highest concentration and shorter duration showed higher value compared to medium concentration. However, values of effectiveness increased slightly in M_3 generation. So also, the highest effectiveness was noted at lowest concentration of 12 hrs duration of treatment. Whereas, the highest effectiveness was recorded in lowest concentration of MH in 6 hrs duration of treatment for both the generations.

The mutagen efficiency was high in relation to lethality at lowest concentration of EMS in medium duration of treatment and the efficiency in relation to injury, mitotic and meiotic aberrations was high at medium concentration of

EMS for 6 hrs treatment. However, efficiency in relation to pollen sterility was more at lowest concentration of MH for 12 hrs treatment duration in M_2 generation.

In M_3 generation efficiency in relation to lethality, meiotic abnormalities was observed to be high at lowest concentration of EMS for 12 hrs treatment duration and efficiency in relation to injury and mitotic aberrations was found to be maximum at lowest and medium concentrations of EMS, respectively for 6 hrs treatment duration. However, efficiency in relation to pollen sterility was highest at lowest concentration of MH for 6 hrs treatment duration.

In general, maximum efficiency was found at medium concentration of EMS for 6 hrs duration in M_2 generation and it was at lowest concentration in M_3 generation. However, highest efficiency for MH treatment was found at lowest, concentration and duration in M_2 and M_3 generations. In M_3 generation efficiency was slightly increased for EMS treated populations whereas, it was reversed in MH treated populations.

It could be noted that, when the mutation rates based on efficiency are considered, the order of mutagens changes depending upon the parameters. The mutations rate in relation to all parameter except pollen sterility was high in EMS treated populations in both generations. The mutation rate

also increased slightly in M_3 generation of EMS treated populations compared M_2 generation. Whereas, it was reversed with MH treated population in M_3 generation.

The treatment of EMS produced flower colour mutations, but no such mutation was observed in MH treated populations. Its frequency was very much low the mutants were white, whitish blue and violet colours.

Some of the viable mutants can be very well exploited on a commercial basis in view of the varied positive characters either for forage or horticultural point of view. In this regard, the highly branched, biflower, flower colour, early and late flowering, and high protein content mutants could be of immense value. These characters can be profitably incorporated in the commercial breeding programme of *C.terantea* to evolve desirable recombinants types carrying a good amount of fodder yielding as well as ornamental potentialities.

The data on quantitative characters such as, plant height, number of nodes to first flower, fifty percent flowering in the population, number of branches, leaves and flowers, length of rachis, size of lateral and terminal leaflets were statistically analysed to understand the effect of mutagen in shifting the mean value. The mean and coefficient of variation value were computed. It was observed that

the parameters, like plant hight, number of branches, flowers and size of terminal leaflet were showing a significant positive shift in the mean values for some treatments of both mutagens.

A study of crude protein content of the control and some of the selected mutants from M_2 and M_3 generation was undertaken in the present investigation, since, plant is of forage value. The pertinent analysis revealed an enhancement in the leaf protein content in most of the mutants. The maximum enhancement in the leaf protein content could be seen in the highly branched mutant induced by MH whereas, maximum reduction in leaf protein level was noticed in small leaf mutant induced by EMS. Similarly reduced protein content was also noticed in sparsely branched and wavy leaflet mutants compared to control. The mutants were obtained in the present investigations on *C.ternatea* are encouraging.