Summary & Conclusions
6. SUMMARY AND CONCLUSIONS

The present investigation entitled “Genetic Improvement of Groundnut \(\text{Arachis hypogaea} \) L.) for Yield Contributing Traits” was undertaken with an objective of inducing genetic variability in yield contributing traits, employing two well known mutagens, EMS and Gamma rays so that viable mutants showing novel and improved yield contributing traits could be screened and isolated during subsequent generations. Attempts were also made to study the mutagenic effectiveness and efficiency of these two mutagens and their impact on yield contributing traits and biochemical parameters. The objectives, on realization, would go a long way in providing broad genetic variability that would be highly beneficial to the groundnut breeders in planning their hybridization programmes and developing superior improved varieties of groundnut having wider adaptability to diverse agro-climatic conditions.

6.1: INTRODUCTION

Groundnut \(\text{Arachis hypogaea} \) L.) Family, Leguminaceae sub family Papilionaceae (Fabaceae)], vernacularly also known as peanut is an important oil seed crop and grain legume widely cultivated in Indian subcontinent. In Maharashtra, it is widely cultivated in Ahmednagar district. Groundnut forms one of the important constituents in the dietary practices of local communities. Groundnut is consumed in the form of edible oil. It is mainly used in cooking, soap making, food recipes, medicines, textile materials and its seeds are eaten as roasted or boiled peanuts. Peanut butter is used in sandwiches, candy & bakery products. Peanuts are also used in wide variety of cosmetics, nitroglycerin, plastics, dyes and paints, and other regional fermented foods. Nutritional composition of groundnut indicates that it has protein content as high as 25 to 26% and 40 to 49 % oil. Its pods form a nutritious item of the food, while the whole plant gives rich feed for cattle. It is also a good manure as it is a leguminous crop which adds nitrogen to the soil and helps in reclaiming of soil. Groundnut is also prescribed as a medicine to fulfill the need of malnutrition.

In spite of its nutritional importance, the yield of groundnut did not witness
much appreciation during the past decade. It has been argued that one of the chief reasons for failure to achieve break through in productivity of groundnut is lack of its genetic variability. Genetic variability is the most essential prerequisite for any successful crop improvement programme as it provides a spectrum of variants for an effective selection process (Jahagirdar, 2005). Mutation breeding techniques are the best methods to enlarge the genetically conditioned variability of a species within a short time and have played a significant role in the development of many crop varieties (Micke, 1988).

Mutation breeding has made significant contribution in increasing the production of different crops like rice, soybean, castor, chickpea, mungbean and urdbean in Indian subcontinent. More than 2,600 varieties have been released, worldwide through induced mutations (Ahloowalia et al., 2004; ).Recently Tan (2008) has reported that more than 3,000 varieties of 170 different plant species have been produced and released globally using induced mutations. Out of these, about 311 varieties are from legumes.

A number of chemical and physical mutagens are widely employed to induce genetic variability in plants. Ethyl Methane Sulphonate (EMS) is a well potential mutagen, widely employed in induction of genetic variability, it is an alkylating agent and induces high frequencies of base pair substitutions. Gamma rays (GR) are the most widely used physical mutagen in crop improvement. Gamma rays are electromagnetic radiation (ionizing radiation) with the highest energy level. They are well known for their action in causing extensive damage to DNA molecules and producing strand breaks and destruction of sugars and bases.

Yield contributing traits viz., Plant Height, Number of primary branches per plant, Number of pods per plant, Number of seeds per pod, Days to flowering, Days to maturity, Hundred Seed Weight and Seed Yield Per Plant, Shelling percent etc. are the metric traits which are quantitatively inherited and directly or indirectly contribute to increase in yield of crop plants. Their inheritance is controlled by multiple (poly) genes. The selection of quantitative traits is more difficult than qualitative traits since they are characterized by the presence of whole spectrum of the phenotypes.
Efforts were also made to screen and select the novel and viable mutants of groundnut showing desired yield contributing traits, from the M$_2$ and M$_3$ progenies. Other objectives of the investigation include, study of frequency, spectrum, effectiveness, efficiency and effective concentration of these mutagens in inducing genetic variability in groundnut and study of phenotypic and genotypic variability, heritability and genetic advance of these mutated agronomic traits so that they can be assessed for their suitability for use in breeding programmes aimed at genetic improvement of groundnut for yield contributing traits.

6.2: MATERIAL AND METHODS

The experimental plant material used in the present investigation is local variety of groundnut \( \textit{Arachis hypogaea} \) L., JL-24. Germplasm of this cultivar of groundnut was procured from the ‘Mahatma Phule Krishi Vidyapeeth, (M.P.K.V.) Rahuri, Maharashtra state, India). Seeds presoaked in water for 8 hours, were treated with different concentrations of EMS (0.05%, 0.10%, 0.15% and 0.20%) for 4 hours at room temperature. Dry seeds were irradiated with 100Gy, 150Gy, 200Gy, 250Gy and 300Gy gamma radiation doses at Department of Bio-Physics, Government Institute of Science, Auranagbad (M.S., India). Seeds not treated with the mutagens served as control. Some of the mutagen treated seeds (50) were grown in Petri plates. These were used for germination studies. About 200 seeds of each treatment were sown in the experimental field, along with controls, following randomized block design in 3 replications to raise M$_1$ generation during kharif season of 2008. The individual seeds of M$_1$ plant progenies were sown in the field to raise M$_2$ progeny and those of M$_2$ to raise M$_3$ progenies. Uniform cultivation methods and agricultural practices were followed for all M$_1$, M$_2$ and M$_3$ generations.

The treated as well as control plant populations were screened for nine yield contributing traits viz., Plant Height, Number of primary branches per plant, Number of pods per plant, Number of seeds per pod, Days to flowering, Days to maturity, Hundred Seed Weight, Shelling percent and Seed Yield Per Plant at both M$_2$ and M$_3$ generations. From each replication and treatment including control, 30 plants were randomly selected.
for recording data on different yield contributing traits in both the M₂ and M₃ generations.

Germplasm of promising macro-mutants showing improved agronomic traits in the M₂ generation were sown separately in the experimental fields to raise viable mutants of M₃ generation. They, along with their controls, were analyzed for biochemical parameters like phosphorus, nitrogen, proteins, oil and fats, carbohydrates, crude fibers, minerals and vitamins following the techniques suggested by Sadasivam and Manikam (1996), using Vanadiumolybdate yellow, Micro-Kjeldal distillation and Nuclear Infrared Resonance (NIR) spectralyser methods. Total seed storage proteins were analyzed following the method suggested by Dadlani and Varier (1993).

Appropriate statistical methods were followed in the investigation to analyze the data. The data collected for individual characters in M₂ and M₃ generations were subjected to the analysis of variance model for RBD method, as suggested by Rangaswamy (2002). The phenotypic and genotypic variances were calculated using the respective mean squares from variance table following the method of Johnson et al., (1955). The genotypic and phenotypic coefficients of variation were calculated following the formulae given by Burton and De Vane (1953). Heritability in broad sense was estimated for various characters as suggested by Hanson et al., (1956). Genetic advance (at 5% selection intensity) was calculated by the formula suggested by the Johnson et al., (1955).

6.3: EXPERIMENTAL RESULTS

6.3.1: Studies In M₁ Generation

M₁ progeny were analyzed for parameters like, percent seed germination, seedling injury, pollen sterility, survival at maturity, morphological and chlorophyll deficient sectors. These parameters are very important to understand the biological damage caused and also for understanding the effectiveness and efficiency of the mutagenic treatments.

6.3.1.1: Effect of Mutagens on Percent Seed Germination, Survival of Plants at Ma-
turity, Seedling Injury, and Pollen Sterility

Percent seed germination and survival of plants at maturity have decreased with an increase in concentration or dose of both EMS and Gamma rays. Thus there is an inverse relation between concentration of the mutagens and percent seed germination and survival of plants at maturity in groundnut. Reduction in percent seed germination was more conspicuous in EMS treatments.

On the other hand both, mutagen, EMS and gamma rays exerted a promotary effect on seedling injury and pollen sterility in M₁ generation.

The observed reduction in percent seed germination and survival of plants at maturity might be due to conversion of certain functional genes into non-functional ones, due to the action of the mutagens. Many chemical mutagens act by chemically modifying bases present in DNA. Ethyl Methane sulphonate is an alkylating agent and well known for its action of adding alkyl (methyl or ethyl) groups to bases at a variety of positions and produce variety of genetic effects viz., transitions, transversions, frame shift mutations (all gene mutations) and chromosome breakage and rearrangements.

Gamma rays, being high energy ionizing radiation, are well known for their action in causing extensive damage to DNA molecules and producing strand breaks and destruction of sugars and bases. Such deleterious effects of these mutagens would render some of the functional genes into non-functional ones. This may eventually lead to lack of required enzymes for carrying out normal metabolism. This in turn may result in slowdown of metabolism or inhibition of several physiological processes that would reflect in to a decrease in percent seed germination or reduction in survival of plants at maturity. Siddiqui and Swaminathan (1969) reported that chromosomal aberrations especially high frequency of translocations was responsible for high sterility. According to Nilan et al., (1964), gross injury due to gene controlled biochemical processes or acute chromosomal aberrations or both may be the reason for pollen sterility.

6.3.1.2: Effect of Mutagens on Morphological Changes And Chlorophyll Deficient Sectors In M₁ Generation
It has been observed that both the mutagens induced chlorophyll deficient sectors (such as chlorina, and xantha) and morphological changes in leaves (curly and variegated leaf), in M₁ plant progenies of groundnut. The frequency of these changes increased with increasing concentration/dose of EMS and Gamma rays. EMS was found to be more effective in inducing morphological changes and chlorophyll deficient sectors in groundnut. Mutagen induced chlorophyll deficient sectors are widely used to estimate effectiveness of the mutagenic agents. Different investigators found that chlorophyll deficient sectors are not heritable.

6.3.2: Studies In M₂ Generation

The individual seeds of M₁ plant progenies were sown in the experimental fields during the Kharif season of 2009 to raise M₂ progeny. On maturity, M₂ progeny were screened for chlorophyll mutations, viable morphological mutations and micro mutations (mutations in yield contributing traits) for polygenic variability and their spectrum as well as frequency were studied in M₂ generation.

6.3.2.1: Chlorophyll Mutations

The M₂ progeny raised from the M₁ seed showed the presence of four types of chlorophyll mutations. They are: striata, chlorina, xantha and albina.

**Striata**: The striata mutants exhibited longitudinal white or yellow strips on their leaves. These seedlings were survived up to 25-28 days, after seed germination.

**Chlorina**: The seedlings were light yellowish green (pale green) in colour. They survived for a reasonably long period.

**Xantha**: The seedlings were completely yellowish and leaves are larger. The seedlings survived for only 7-8 days.

**Albina**: Leaves are white in colour and the seedlings died after few days.

Frequency of these chlorophyll mutations increased with an increase in concentration/dose of the mutagens. Both the mutagens were found effective in producing high
frequency of chlorophyll mutations.

According to Chopra (2005), the high frequency of chlorophyll mutations obtained with mutagens, is due to preferential action of these mutagens on genes for chlorophyll development /or the preferential effect on guanine in the G-C rich chloroplast genome.

Biosynthesis of photosynthetic pigments occurs in a series of biochemical reactions. Both the mutagens are potent well known for their action in inducing point mutations, and chromosomal aberrations. Any alteration in the nucleotide composition of the genes, that control the synthesis of enzymes involved in the biosynthesis of pigments, as result of action of the mutagens, would eventually lead to the observed chlorophyll mutations.

6.3.2.2: Mutagenic Effectiveness and Efficiency

Mutagenic effectiveness and efficiency are two reliable parameters in plant breeding which are used to evaluate a mutagen. Mutagenic effectiveness provides relationship of mutagens to different manifestations. Mutagenic effectiveness of EMS and GR was assessed on groundnut in inducing various manifestations. The mutagenic effectiveness was directly proportional to EMS and inversely proportional to the increasing doses of mutagens in groundnut. Low concentrations or doses were found to be most effective. The mutagenic effectiveness decreased with increase in increasing doses of gamma..EMS was found to be most effective mutagen in groundnut as compared to gamma rays. The order of effectiveness of the mutagen was EMS > GR. The decrease in effectiveness with increasing concentrations of mutagen could be attributed to the biological damage (like seedling injury, lethality, and sterility) which increases with increase in dose at faster rate than the mutations.

Mutagenic efficiency is the frequency of chlorophyll mutations in relation to M₁ damage. Both the mutagens exhibited decrease in mutagenic efficiency with an increase in concentration or doses with respect to pollen sterility, seedling injury, and lethality in groundnut. According to Konzak et al., (1965) the higher frequency at lower concentra-
tion of a mutagenic agent is due to the biological damage (like seedling injury, lethality, and sterility) which increases with increase in dose at faster rate than the mutations.

The responses of physical and chemical mutagens are influenced by number of biological, environmental, and chemical factors. According to Blixt (1968), effectiveness of any mutagen depends on its dose or concentration and specificity to act on genes and genetic make-up of the cultivars. The exact mechanism, by which many of these factors influence mutation frequency, is not known.

6.3.2.3: Viable Mutations of M<sub>2</sub> Generation

Ten different types of viable morphological mutations could be screened during the M<sub>2</sub> generation in the mutagen administered M<sub>2</sub> progeny of groundnut.

6.3.2.3.1: Frequency of Viable Mutations

Mutagenic treatments of EMS and gamma rays resulted in generation of wide frequency and spectrum of viable mutations during M<sub>2</sub> generation of groundnut. The mean frequency of total mutations was relatively high in EMS than Gamma rays doses. In the present investigation, it was observed that the frequency and spectrum of viable mutations increased with increasing concentration of EMS and gamma rays. This could be due to differential mode of action of the mutagens on different base sequences in various genes.

6.3.2.3.2: Spectrum of Viable Mutations

Ten various types of viable morphological mutations could be screened during the M<sub>2</sub> generation in the mutagen administered M<sub>2</sub> progeny of groundnut. They could be classified in to 4 broad categories, depending on the habit, shape, or organ on which they appeared. Accordingly they are classified as, Plant type (tall, miniature, early, late, spreading, high-yielding,) mutations, Leaf mutations. Pod mutations, Seed mutations.

6.3.2.3.3: Plant Type Mutations
The five different morphological plant type mutations have been observed in M₂ progeny of mutagen administered groundnut. These are tall, miniature (small leaf), early, spreading, and high yielding mutations. Prominent among these are Tall and High yielding mutants. Spreading mutants are characterized by their spreading habit. Miniature mutants are with small leaves and short in stature. The dwarfness can be ascribed to reduction in height due to the shortening of internodes. Early mutants obtained in the present study showed rapid growth and early maturity. Early mutant are always preferred for plant breeding strategies in almost all crops. Jana (1962) explained the early maturity might be due to physiological changes caused by irradiation and production of flowering hormones. Sparrow (1962) reported that early maturity mutants have been attributed to disturbances in auxin balance which consequently reduced photoperiodic cycle. Spreading mutants were also reported by Bhamurkar (1981), and Sudharani (1990) in blackgram. Such mutations can be considered as evolutionary conversion of the plant habit genes in groundnut carrying substantial polygenic significance.

6.3.2.3.4: Leaf Mutations

A very narrow spectrum of leaf mutations was observed in the M₂ progeny of groundnut, which were restricted to two types of leaf morphology mutations. These were curly and small leaf mutants. According to Tara and Dnyansagar (1979), changes in shape of leaves are due to chromosomal aberrations produced in the plant as a result of action of chemical mutagens and ionizing radiations. Joshua et al., (1972) have correlated the development of leaf abnormalities to the pleotropic action of mutated genes. These leaf mutations obtained in the present investigation may be useful as genetic markers in the conventional breeding. Even they may be of immense value in understanding the genetic control of leaf formation and regulation of their size, shape and form.

6.3.2.3.5: Pod Mutations

Three types lining, smooth and small pod mutants were observed in the present experimental work. Patil (1966) and Reddy et al. (1986) have reported the predominance of leaf modification mutants than other characters and the present results confirm
these earlier reports. Mutants for pod characters included pod size, shape and texture. Similar variation in pod size was reported by Qui (1982) who reported gamma rays induced mutant with large pods. The mutants with small pod size, less or more reticulation, three seeded pods were also obtained in the present investigation.

6.3.2.3.6: Seed Mutations

Variability was induced in color and size of groundnut seeds employing EMS and Gamma rays. The spectrum of seed mutations induced in groundnut include, bold seed, white and pink seed coat colored seeds.

Among all the mutants obtained in the present investigation, the Early Maturing, High Yielding and Bold Seed mutants are agronomical most important and these mutants can be used in breeding experiments for developing new improved varieties of groundnut.

In general, relative differences in mutability for different traits have been observed in the present study. The more frequent induction of certain mutation types by a particular mutagen may be attributed to the fact that the genes controlling these characters may be more responsive to either alkylating agents or ionizing radiations. This could be due to differential mode of action of the mutagens of different base sequences in various genes. EMS induces mutations largely by producing guanine-cytosine to adenine-thymine transitions, depurination or by deletion of large segments of DNA (Heslot, 1965). Further dose dependent enhancement of the frequency and spectrum of mutations in a predictable manner and thereby achieving desired plant characteristics at higher dose has been reported by Swaminathan (1963).

The viable mutants, induced in the present investigation can definitely be utilized in future breeding programmes, aimed at genetic improvement of groundnut. Leaf, pod, and seed mutations obtained in the present investigation might have arisen as a result of mutations in the genes that control the ontogeny of these organs through their gene products and altered biosynthetic pathways. Various leaf mutations obtained in the present investigation can be used as genetic markers in the conventional breeding.
Thus, one of the major objectives of the present investigation, i.e. induction of genetic variability in yield contributing traits in groundnut has been fulfilled. All these viable mutations will definitely prove to be valuable as genetic stocks that can be used in hybridization programs aimed at genetic improvement of groundnut.

6.3.2.4: Yield Contributing Traits In M$_2$ Generation

Mutagenic effect on nine yield contributing traits (plant height, branches per plant, number of pods per plant, days to flowering, seed yield per plant, number of seeds per pod, days to maturity, shelling percent and 100 seed weight) was studied from the M$_2$ progeny. The experimental findings revealed that concentrations / dose of all these two mutagens showed promontory effect on plant height, number of pods per plant, 100 seed weight, yield per plant, number of seeds per pod, and shelling percent. while both promotory and inhibitory effects on days to flowering, 100 seed weight, plant height and days to maturity. Statistical analysis of phenotypic coefficients of variation (PCV) and genotypic coefficients of variation (GCV), for all ten yield contributing traits indicated that PCV was higher than the GCV and the difference between these two was very small for majority of the yield contributing traits. The narrow difference between PCV and GCV indicates that these traits were less influenced by environment. In the present investigation high heritability coupled with high genetic advance was also observed for traits such as plant height, number of pods per plant and seed yield per plant, shelling percent etc. High heritability observed for various yield contributing traits offer wide scope for selection of these traits in breeding programs for genetic improvement of groundnut.

6.4: STUDIES IN M$_3$ GENERATION

6.4.1: Morphological Characterization of Viable Mutants of M$_3$

Five viable macro mutants, isolated from the groundnut during M$_3$ generation employing the EMS and gamma rays mutagens, are described below.

i. Tall Mutant
Tall mutants were isolated from M$_2$ progeny of 0.15 & 0.20% EMS, and 150 & 200Gy gamma radiations administered JL-24. Mean height of mutant was 57.16cm while that of control variety is 34.93cm. This mutants showed increase in the number of pods per plant, yield per plant, shelling percent and biological weight.

**ii. Pod Mutant**

The lining pod mutants were isolated from 0.10 and 0.20% EMS and 150Gy gamma radiation dose. This mutant showed significant increase in the traits viz, number of pods per plant, number of branches per plant, 100 seeds weight, and shelling percent. These mutants were characterized by their lining pods.

Similarly smooth pod mutants were isolated from the 0.05 and 0.10% EMS and 100 Gy dose of gamma dose. This mutant also showed increase in number of branches per plant, number of pods per plant, number of seeds per pod, shelling percent, and seed yield per plant. These mutants were characterized by smooth surface of pods. The small pod mutants were isolated from 0.05% EMS. This mutant showed the decrease in all traits except shelling percent.

**iii. Early Maturing Mutant**

Early mutants were isolated from 300 Gy treatments of gamma radiation. This mutant was early in flowering and maturity at least by 8-10 days earlier than the control. Early mutant showed increase in number of pods per plant, 100-seed weight, biological yield, and harvest index.

**iv. High Yielding Mutant**

The remarkable achievement of the present investigation is isolation of High Yielding mutants. These mutants were isolated from 0.15, and 0.20% treatment of EMS and 200 and 300Gy gamma radiation. These mutants showed significant increase in almost all yield contributing traits as compared to control.

**V. Seed Coat Color Mutant**
This mutant was isolated from 0.15% EMS and 300Gy dose of gamma. These mutants were characterized by white seed coat color and pink seed coat color.

6.4.2: Biochemical Characterization of Mutants

In plant breeding, the recent trend is to support the traditional methods with biochemical investigations, so as to obtain better estimates of the breeding values of a variety or genotype. By keeping this object in mind, biochemical characterization of viable mutants for parameters such as, total nitrogen content, total phosphorus content, oil content, protein content, carbohydrate content, fiber content, minerals and vitamin composition were estimated.

i. Nitrogen Content (%) : Results on total nitrogen content revealed that there is slight decrease in nitrogen content in tall, lining pod, soft pod, small pod, and bold seeded pod. While there is increase in nitrogen percent in early maturing, high yielding spreading, white & pink seed mutants than control.

ii. Phosphorus Content(%) : All the mutants except tall, early and spreading mutants showed decreased levels of phosphorus. The decreased in phosphorus level, observed in the viable mutants indicate a decrease in phytic acid levels. Low phytic acid levels in the mutant is very much desirable since it helps in better nutritional quality and helps in increased absorption of iron, zinc and other minerals in humans.

iii. Total Protein Content(%) : Among all the macro mutants of the groundnut, the white seed, high yielding, early maturing and spreading mutants showed an increase in total protein content as compared to control. The results of this study clearly indicate that useful variations in qualitative traits like protein content can be successfully induced and significantly improved through mutagenesis in groundnut.

iv. Oil Content (%)

The present studies of macro-mutants of groundnut have indicated considerable variation regarding total oil content. All ten mutants viz., early, tall, high yielding, lining pod, smooth pod, small pod, spreading, white & pink seed coat color and bold seeded
mutants showed positive shift in mean values as compared to control, indicating an increase in oil content. Pink seed coat colour mutant showed maximum oil content (56.03%) followed by white seed coat colour mutant (49.08%). Results of the present investigation indicate that mutation breeding is useful in improving the oil content of groundnut.

v. Fat Content (%)  

In the present study tall, lining, soft & small pod as well as white, pink seed coat color and bold seeded mutants showed increase in fat content than control except earl, high yielding and spreading mutants, Among all, white seed coat colour mutant showed highest fat content (46.61%). However, in the present investigation results revealed that mutagens are useful in improving the quality of fats in groundnut.

vi. Carbohydrate Content (%)  

All the mutants showed increased carbohydrate content, but white seed coat colour mutant showed maximum (31.10%) content of carbohydrate than control (25.71%) in groundnut.

vii. Crude Fiber Content (%)  

There is no significant increase in crude fiber content in mutants as compared to control.

viii. Mineral Content (mg/100g)  

The minerals like calcium, iron and other minerals in milligrams per 100 gram showed increase in some mutants. Specifically calcium in pink seed coat colour mutant and iron in white seed coat colour mutant. The other mineral content were decreased in high yielding and pink seed coat colour mutant.

ix. Vitamin Content  

The vitamins estimation like niacin, riboflavin, thiamine, carotene were also car-
ried out for all mutants. The early mutant showed increase in niacin and carotene, pink seed coat colour mutant showed increase in all vitamins.

From the results obtained in the present investigation, it can be concluded that both the mutagenic treatments are highly effective in inducting genetic variability with significant alteration in yield contributing traits and biochemical parameters. The results obtained decisively demonstrate the usefulness and effective potential of the induced mutational approach in genetic improvement of groundnut (*Arachis hypogaea* L.) for recovering superior mutant plant types having enhanced yield, oil content, and protein content and to induce variability in fat composition and oil quality. The present study with respect to isolation of ‘viable mutants’, particularly plant type mutations, have been remarkably successful. Some of these viable mutants have been found to be superior to their parent varieties in several respects (agronomic traits).

Some of the mutants isolated in the present investigation were exhibiting negative selection value and these might be useful only to the plant breeder to be used as qualitative traits, in hybridization programmes. But a few mutants could be improved through selection by eliminating some of the undesirable characters. These mutants with advantageous yield contributing traits are being submitted to Mahatma Phule Agricultural University, Rahuri, NBPGPR, Nagpur and BARC, Mumbai so that they can be used in breeding programmes aimed at genetic improvement of groundnut for yield contributing traits (agronomic traits). After stability and multi-locality trials and after subsequent generations, some of the high yielding mutants will be tried to release as new mutant varieties of groundnut.