The germination percentage of seeds of three varieties of *Vigna unguiculata* (L.) Walp. cv. GC 3, MBSL and MVL decreased with increasing concentrations of NaCl. The GC 3 seeds showed germination at 15 mmhos/cm salinity, but the percentage of germination was lower, whereas the MBSL and MVL seeds did not germinate at this concentration of salinity. Among the three varieties, GC 3 showed higher percentage of germination at all salinity levels. The GC 3 seeds which were collected from saline area and sown in saline area showed higher percentage of germination compared to the seeds collected from non-saline area and sown in saline area. A decrease in the percent germination of treated seeds with increasing salinity is attributed to the reduced water uptake and decreased enzyme activity in the presence of higher sodium ions in the medium.

Salinity also inhibited the elongation of radicle and hypocotyl during germination of seeds. The decrease in shoot length with increase in NaCl concentrations was also evident from the pot experiment. In the field experiment it was observed that the shoot length was less in the plants grown in the saline area compared to the non-saline area. In all the three varieties, fresh and dry weights of embryo axis decreased with increase in salinity. There was a reduction in the percentage of moisture content in the embryo axis with increasing concentrations of NaCl. The fresh weight of the cotyledons decreased with increase in the concentrations of NaCl. The dry weight of cotyledons of all the varieties decreased during all the stages of growth of the seedlings at all concentrations, but increased with increasing concentrations of NaCl at every stage. This may be due to inhibition of hydrolysis of reserve foods and their translocation. The leaf emergence was delayed in the treated seedlings when compared to the control seedlings. The delayed leaf emergence and the reduced growth in the treated seedlings may be attributed to the impaired enzyme activities and delayed mobilization of stored products.
Amylase activity was inhibited by salinity, the rate of inhibition increased with increasing salinity. The inhibition of amylase activity was observed in the leaves of plants grown in saline area compared to the leaves of plants grown in non-saline area. The starch content in all the varieties increased with increasing concentrations of NaCl. Higher starch content was observed in the seeds/seedlings raised from the seeds collected from non-saline area compared to the seeds collected from the saline area. GC 3 seeds/seedlings showed low starch content compared to the other two varieties. The increase in the starch content with increase in salinity may be due to the fact that, with increase in salinity, breakdown of starch is less due to low amylase activity. The total soluble sugar content in the seeds/seedlings of all the varieties decreased with increasing concentrations of NaCl. This may be due to the oxidation of sugars for releasing energy for prolonging the survival under salt stress. Higher amount of total soluble sugar was found in the GC 3 seeds/seedlings compared to the MBSL and MVL varieties. The higher amylase activity and higher accumulation of sugars in the seeds collected from saline area compared to the seeds collected from non-saline area indicates the increased ability of the former seeds to tolerate NaCl stress. The higher amylase activity and total soluble sugars were high in GC 3 seeds/seedlings raised from the seeds collected from saline area indicates the superiority of GC 3 seeds over others in saline areas.

The protease activity increased with increase in NaCl concentrations in all the three varieties. It was lower in GC 3 seeds/seedlings and higher in MVL variety than MBSL. Seedlings raised from seeds collected from saline area showed higher activity than that of the seeds collected from non-saline area. In the field experiment it was found that protease activity was higher in the saline area compared to the plants of non-saline area. Protease activity was higher in the germinating seeds grown in 12.5 mmhos/cm NaCl solution throughout the period of investigation. Increased protease activity was accompanied by a
decrease in protein content in the salt stressed seedlings. Protein content was higher in all the plants grown in saline area compared to the plants grown in non-saline area. Protein content was higher in the GC 3 plants raised from seeds collected from saline area than the other varieties. The lower protease activity in GC 3 seeds/seedlings probably protects the saline plants from hydrolysis of proteins.

Activities of acid and alkaline phosphatases in all the three varieties increased with increase in the concentrations of NaCl. The activity of acid phosphatase was higher in the seeds/seedlings of all the varieties compared to the activity of alkaline phosphatase. Higher activities of acid and alkaline phosphatases were found in the seeds/seedlings raised from seeds collected from saline area compared to the seeds collected from non-saline area. In the field, plants grown in saline area showed higher activities compared to the plants grown in non-saline area. It is possible that salinity might have induced new phosphatases to play a vital role in osmoregulation. The increased activity of phosphatases appears to release more of inorganic phosphate, enabling the cells to be metabolically active with the liberation of metabolic energy under saline conditions. There was increased acid and alkaline phosphatase activity during germination and growth of treated and control seedlings, which was accompanied by an increase in inorganic phosphate liberation.

The peroxidase activity was enhanced with increasing concentrations of NaCl during germination as well as during the growth of seedlings. The increased peroxidase activity indicates the ability of the varieties to break certain toxic substances like peroxide, phenols, etc. under salt stress. The higher peroxidase activity found in GC 3 variety enables it to perform better in saline areas compared to other variety. The increase in peroxidase activity in the field grown plants during the growth again illustrates the ability of these plants to sustain at higher salinity levels.
Total amino acids increased with increasing concentrations of NaCl in all the germinating seeds. Higher level of amino acids were observed in GC 3 variety compared to other varieties which again indicates the relatively higher tolerance of this variety to NaCl stress. Higher level of amino acids were found in radicles of GC 3 compared to other parts. The amino acid proline also showed similar increases in all the seeds/seedlings. Since, roots are the prime sites of water absorption, they accumulated more proline probably to maintain osmotic balance between water absorbing root cells and external media. NaCl induced synthesis of proline and its accumulation associated with stress may serve as a suitable solute in order to maintain the osmotic balance between the cytoplasm and vacuole and thereby play an important role in developing resistance to salinity. Higher proline content and total amino acids in the plants grown in saline area compared to the plants of non-saline area indicate the increased tolerance of these plants to salt stress by supplying energy for growth and survival in the saline condition.

The Na⁺ content increased and K⁺ content decreased in the germinating seeds of all the three varieties with increasing concentrations of NaCl. Even, the leaves of plants treated with NaCl showed higher levels of Na⁺ and lower levels of K⁺ compared to the control plants. The increased accumulation of Na⁺ seems to help the plants in building up of the osmoticum. Na⁺ / K⁺ ratio increased with increase in NaCl concentration in all the varieties. Increased Na⁺ / K⁺ ratio in V. unguiculata seeds/ seedlings in the present study is indicative of greater uptake of Na⁺ in detriment of K⁺ under high salinity conditions resulting in a disturbed ionic balance, which probably suppress seedling growth. Lower Na⁺ / K⁺ ratio in GC 3 seeds/ seedlings explains its better performance in the saline area compared to the other varieties.

The percentage of AMF colonization was less during first week of germination but from second week onwards (trifoliate leaf stage of seedling)
extensive development occurred and this continued during the growing period. There was a continuous increase in the percentage of AMF vesicles during the growth of plants. During eighth week, when the plants were in the fruiting stage, the percentage of root colonization by AMF was maximum. The highest average spore count in the rhizospheric soils of *V. unguiculata* was recorded during the eighth week. The total root colonization was less in the plants of saline area compared to those of non-saline area indicating inhibition of AMF development in the saline soils.

Soil phosphorus is negatively correlated to the root colonization since soil phosphorus reduces AMF formation. In GC 3 and MBSL plants grown in saline area a significant positive correlation was observed between pH of the soil and spore number/root colonization. In all the three varieties grown in saline and non-saline areas, only GC 3 plants grown in saline area showed a significant positive correlation between Na\(^+\) content of the soil and AMF spore number/total root colonization. The higher EC values of saline area resulting in the reduction in AMF spore number and total root colonization indicates the influence of salinity on the AM fungi.