Conclusions
CONCLUSIONS

Seed Storage and Viability: Seed germination results revealed that seeds stored at low temperature showed better germination as compared to those kept at room temperature in the first two years. However during the third year the germination percentage declined considerably in seeds stored at both the temperatures. Seed germination was best when germinated in the same year after harvesting and germination percentage was also higher as compared to stored seeds. Similarly, the Average length of the seedling and the fresh weight of the seedling and Seedling Vigor Index were better in seeds stored under cold temperature.

Cenchrus- Dichanthium- Sehima: It is observed that *C. ciliaris* can grow well even in the mixed patch and dominates over *D. annulatum*. Severe warm conditions of summer could not affect the growth of *C. ciliaris*, which kept on flourishing well in such conditions while *S. nervosum* could not grow so no data could be collected. *C. ciliaris* has been considered as a highly drought resistant grass species. It is adapted to a wide range of soil and climatic conditions. *D. annulatum* grows well in pure patch but when *D. annulatum* is grown in combination with *C. ciliaris*, its growth is affected due to profusely growing *C. ciliaris*. *C. ciliaris* is a particularly aggressive grass, by virtue of its extensive root system competing with associated species for water and nutrients. It also appears to be allelopathic (Suppression of other species by exudation of phytotoxic chemicals that inhibit germination and growth of other plants). Allelochemicals increasing in the roots exude and cause inhibition or arrest of growth of other plants. These interactions mainly in the rhizosphere, hence results in the better establishment of *Cenchrus* as against *Dichanthium* and *Sehima*. This observation needs to be further explored and experimented with to understand allelopathic interactions among various grasses.

Effect of Fertilizers: As evident from the results there is a linear increase in shoot length with time. After 60 days combination of NK proved to be good for shoot length. Statistical analysis of the data shows that combination of NK, PK and NPK is significant in shoot length. Nitrogen (N), phosphorus (P), and potassium (K) are needed
in most fields to support forage production at economic levels, produce quality forage, and to replace nutrients removed in forage harvests.

It is observed that when all three fertilizers were given the root length was longest. All three fertilizers play important role. Initially P and K gave better results but later on good root length was observed with Urea. Significant difference was found in all treatments The treatment with N,P,K singly indicated variable results on plant height, shoot length, root length. In fact root length was not markedly affected by N, P or K alone while in combination they did have a positive response.

It is observed that best results were obtained when all three fertilizers were given and when NK were given in combination. Results were good even when K alone was given. maximum leaf breadth was due to combination of NPK. But NK combination proved better than PK and NP in increasing leaf breadth of *Cenchrus ciliaris* plant. Only T8 was significant and all other treatments were not significant.

Maximum tillers were observed when all three fertilizers were given. NK combination also gives good results but nitrogen has major role in increasing number of tillers. When urea alone was given equally good number of tillers were seen. In *Cenchrus* increasing N did increase number of tillers but the effect of N was further supplemented by the use of K.

Maximum number of ears were observed with NPK. K (Muriate of potash 260 kg ha\(^{-1}\)) and N (Urea 400kg ha\(^{-1}\)) alone also gave good results. Similarly NK combination was also good. Best results for ear length was observed with NK and NPK. Combination of NK, PK, NP, N(Urea 400kg ha\(^{-1}\))and K (Muriate of potash 260 kg ha\(^{-1}\)) separately gave good results. After 60 days maximum ear breadth was seen when all three fertilizers N, P and K were given. Combination of NK, PK and NP also showed some difference. But statistical analysis showed that all treatments were not significant. Statistically the ear breadth seems to be non responsive to all the treatments and can be termed as statistically insignificant.

Fresh weight of ears is promoted by all three fertilizers. But K plays a major role as when only (Muriate of potash 260 kg ha\(^{-1}\)) is given good results are seen. Combination of fertilizers NK give better results compared to PK. When only urea is given results are better compared to Superphosphate. All the treatments were highly significant
statistically. Dry weight of ears is maximum in T10 when all three fertilizers N, P and K are given. After 60 days results with muriate of potash (260 kg ha\(^{-1}\)) is maintained. Combination of fertilizers NK give better results compared to PK and NP and least value is seen in control.

It is concluded that all three fertilizers N, P and K are essential for the growth and above ground biomass of *Cenchrus ciliaris* (CAZRI 358) plant. But fertilizer N was needed in more quantity (400 kg ha\(^{-1}\)). Fertilizer P and K also had role to play in the growth and above ground biomass. When N (200 kg ha\(^{-1}\)), P(130 kg ha\(^{-1}\)) and K(130 kg ha\(^{-1}\)) were given the yield was comparatively less. So, by giving more amount of fertilizers yield of aboveground biomass can be increased. Comparing highest yield with NPK with that of the control it is observed that there is drastic increase in aboveground biomass due to application of all three fertilizers. There is a gradual increase with time i.e., from 20 to 40 to 60 days maximum reaching at 60 days irrespective of treatments. Nevertheless, considering that *Cenchrus* is a valuable fodder grass above ground biomass would be significant and so, its promising increase with the use of fertilizers is worth noting. Initially dry wt. of control (without any fertilizers) is very meager, but in all the treatments the dry wt. increases with the application of all three fertilizers. After 60 days it is observed that Urea and Muriate of potash has major role in increasing the above ground biomass.

It is revealed that relative growth rate for T10 is best which shows NPK fertilization is best, T8 is also good which is next to T10 proves NK combination was also effective. Treatments T1, T2, T7 and T9 also reported good results which shows urea alone or fertilizers in combination proved to be better.

Maximum belowground biomass in terms of fresh wt. is observed in T10 when all three fertilizers are given and least in control. When fertilizers NK and PK are given in combination root growth is good. Even when only N is supplied good below ground biomass is seen. Thus all three fertilizers play important role in increasing belowground biomass. When all three fertilizers N, P and K are given good belowground biomass is observed in *Cenchrus ciliaris* plant but NK showed best results. In terms of dry weight when all three fertilizers Urea, Super phosphate, muriate of potash were given below ground biomass of the plants was improved. Experimental evidences suggest a
proportion of Urea-400kg/ha + Superphosphate-260kg/ha+ Muriate of potash-260kg/ha as a recommended dose for optimum productivity.

The response of *Cenchrus ciliaris* was greatly reflected under application of NPK. It can be concluded that NPK treatment was significantly superior over rest of the treatments for all the parameters and NK proved next best nutrient combination.

**Clipping Results:** Greater herbage was produced when the plants were clipped at a height of 15 cm and at an interval of 45 days, as compared to 10 cm, 5 cm, base heights, and 15-day and 30-day interval of clipping. Thus, 15 cm seems to be an optimum height for increased herbage production in *Cenchrus ciliaris*. For belowground production frequent clipping (15 days interval) apparently renders little time for herbage replacement, hence food manufacture and downward translocation was limited which caused the retardation in root growth. Clipping height also had a significant effect upon root growth. The closer clipping reduces the herbage yield and this in turn the belowground production. The height of the plant was thus substantially reduced to clipping and number of tillers are reduced during frequent clipping intervals 15- and 30-days. It may be argued that biweekly and monthly clipping of the herbage reduces the amount of food materials available for translocation to the roots which in turn lowers the capacity of *Cenchrus ciliaris* grass to produce new tillers.

**Seasonal Study:** *Cenchrus ciliaris* (Dhaman) is a warm season grass and sprouts in February and becomes dormant at the end of September after seed dispersal. In spite of irrigation and fertilization the grass took very long to get established. As *Cenchrus ciliaris* is a warm season grass the average height of the plant in the winter season is less due to less growth vigour. The *Cenchrus* plant in summer and monsoon season exhibits greater height as compared to same in winter. Similarly, the number of tillers decrease from summer to monsoon to winter. Crop growth in buffel grass peaked at the time both high temperature and important precipitation events or sufficient soil moisture coexisted. Buffel grass grows at a slower rate during cooler weather than many other tropical grasses. Cool weather exerts a negative impact on growth in buffel grass.

**Nutritional Status under Influence of Fertilizers:** The amount of crude protein decreases with advancement of days from 20 to 40 to 60 days in all treatments. This reflects on the utilization of proteins during growth and maturity. Maximum amount
of crude protein is observed at 20 days stage which then gradually declines. Fertilized
plants gave higher values of crude protein than nonfertilized plants. There is not much
difference in the concentration of Fiber under all treatments when compared with control.
Less content of Silica was found in T10 when compared with control, hence it can be said
NPK treatment is good. Reducing the amount of plant cell wall constituents, including
hemicellulose, lignin and silica can improve nutrient availability. The reduction in
amount of N indicates its utilization. Also, there is an increase in P with time in all
treatments indicating the storage of P in nucleic acid formation and / or its role in
phosphorylation. K does not exhibit much appreciable change and its utilization by the
plants is not different than in control plants.

Post harvest Results: The results of storage reveal that grass stored at 5±2°C
temperature is better in nutritive value. It is seen that there is significant difference
between nutritive value of Control( value obtained before storage) and the grass stored at
20±2°C temperature, whereas difference is non significant between Control( value
obtained before storage) and grass stored at low temperature. Thus it is observed that
there are very less nutritive changes when grass is stored at low temperature. All fresh
moist crops start rapidly deteriorating just after harvesting, due to chemical changes
within plant and spoilage caused by microorganism. The aim of conservation is to
discourage this deterioration. Low temperatures or almost freezing the plant material
results in near zero metabolism, so spoilage can be prevented. The cost-benefit ratio has
to be worked out. A viable user friendly model that would encourage the farmers and
those in agribusiness to prioritize the storage of fodder on a large scale would be
appreciated.