4. Climate Change

Climate change impacts on agriculture are being witnessed all over the world, but countries like India are more vulnerable in view of higher demographic pressure on natural resources and poor coping up mechanisms. Models generally predict that rising temperatures, increased climate variability and extreme weather events could significantly affect food production in the coming decades.

Effect of elevated CO_2 on greengram and associated weeds: The elevated CO_2 (550 ± 50 ppm) influenced growth and development, physiological and biochemical aspects in greengram (K 851) and two weeds (*Euphorbia geniculata* and *Commelina diffusa*). There was enhanced shoot and root growth of greengram and two weeds with elevated levels of CO_2. Also, there was more nodule development in greengram at elevated CO_2. Rate of photosynthesis, transpiration, and water-use efficiency were also higher at elevated CO_2. Greengram accumulated more H_2O_2 and superoxide at elevated CO_2 and all the three species showed considerable differences in protein profiles due to CO_2 elevation.

New initiative on Climate Resilient Agriculture: A new scheme, namely 'National Initiative on Climate Resilient Agriculture' was conceptualized to address the problems related to abiotic and biotic stresses. The scheme has three components, viz. (i) strategic research on adaptation and mitigation of important grain and horticulture crops, livestock and fisheries, (ii) demonstration of best technologies in 100 most vulnerable districts to cope up with current climate variability, and (iii) capacity building of researchers, planners, ToT personnel and farmers.

Impact, adaptation and vulnerability of Indian livestock to climate change: Animal stress level due to temperature rise was worked out using temperature humidity index (THI). Analysis of stress level revealed that for 160–165 days during the year average THI was less than 65 in northern India and for about 50 days the THI ranged between 66 and 70. THI remained more than 70 for 40–42 days and THI ranged between 75 and 80 for 95–100 days during the year. Temperature rise of more than 4°C is likely to increase uncomfortable days (THI>80) from existing 40 days (10.9%) to 104 days (28.5%) for HADCM3-A2 scenario and 89 days for B2 scenario for time slices 2080–2100. This change in THI has a negative impact on the livestock production both directly and indirectly.

Climate change and poultry production: Under the ICAR Network Project on Climate Change, the impact of high ambient temperature on survivability and performance was evaluated. As the ambient temperature reached ≥34°C the mortality due to heat stress was significantly high in heavy meat type chickens (8.4%) as compared to light layer type (0.84%) and native type (0.32%) chickens. Feed consumption decreased from 108.3 g/bird/day at 31.6°C to 68.9 g/bird/day at 37.9°C. The egg production also decreased both in broiler (by 7.5%) and layer (by 6.4%) breeders as compared to their standard egg production. The body temperature increased from 41 to 45°C as the shed temperature rose from 28 to 42°C and the critical body temperature at which the birds succumbed to death was 45°C, which was observed at the shed temperature of 42°C. Naked neck birds performed significantly better than the normal birds with respect to thermotolerance, growth, feed efficiency and immunity at high temperatures.

❑