



Global climate change : A threat for potato production

J.S. MINHAS^{1*} and PRINCE KUMAR²

¹Principal Scientist & Head (Plant Physiology), ICAR-CPRS, Jalandhar (Punjab)

²Scientist (Vegetable Science), ICAR-CPRS, Jalandhar (Punjab)

E-mail : minhas.joginder@gmail.com

Potato originated under cool climate of Andean highlands in South America. It was introduced to Europe in 15th century and adapted to long cool summer days. The crop was brought to India during early 16th century but remained restricted to cool summers in hilly regions. Organized crop improvement through breeding and selection by ICAR - Central Potato Research Institute, Shimla adapted the crop to short winter days and now is a major *rabi* crop in Indogangetic plains from Punjab to West Bengal. Indo-Gangatic plains account for than 85 per cent of potato acreage with hills and plateaus accounting for about 15 per cent of the total acreage under the crop. Presently, potato is the fourth most important food crop in the world and has been declared as future food crop by FAO during the International Year of Potato (2008). Potato produces highest amount of edible energy and proteins per unit area per unit time among all the major food crops. Indo-Gangatic plains account for more about 85 per cent of potato acreage with hills and plateaus accounting for about 15 per cent of the total acreage under the crop. India is second largest potato producer in the world with 45 million tonnes of potatoes from about 2 million ha area.

Potato is propagated through sexual (True Potato Seed *i.e.* TPS) and asexual means (Seed Tubers). TPS is not very popular because of several constraints like seed availability, high segregation rate, longer crop duration, high labour input etc. A novel seed production technology known as '**seed plot technique**' was developed by CPRI in the 1960's to produce high quality seed tubers in plains that revolutionize potato production in the country. The technique depends upon the aphid free window along with other operations from October to December for seed multiplication. Warmer pestiferous environments due to climate change pose a great threat to seed plot technique. Rate of degeneration due to vector transmitted viral and other soil and tuber borne diseases is very high during clonal multiplication in relatively warm climatic conditions in plains of India.

Current status of potato and seed potato in India : During 1949-50, 1.54 million tonnes of potato was produced from 0.23 million hectares of area compared to the current production of 44.72 million tonnes from 1.96 million ha of area and is second largest potato producer in the world. By virtue of which in the last six decades, there was 8.4 times expansion of area and 29 times in production. To cultivate this area our country requires 4.53 million tonnes of seed material. Moreover, farmers of the north - eastern states and south - west areas are fully dependent on northern plains for the quality planting material. Modern technologies are being utilized to enhance quality and multiplication rate of seed tubers. For example meristem tip culture is being used to free potato plants of all the viruses, tissue culture and aeroponics system are being used for faster multiplication of virus free seed stocks. Many private companies have also entered potato seed business thus enhancing quality, quantity and availability of seed potatoes.

Climate change : It refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period. Climate change may be due to natural internal processes or external forcing, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Green house gases emission especially CO₂ which is linearly increasing from 1960 is the major reason of climate change. According to the American Meteorological Society, global temperatures will rise by 3.5 to 7.4°C in less than one hundred years. Climate change is a serious challenge to farming community in the world, more so in the developing countries in the tropical and subtropical areas like India, where most of the crops are already at the higher end of temperature tolerance and any further increase will seriously affect food security and livelihood of farmers.

Direct effects of climate change : The production of potato will increase by about 30 per cent with the CO₂ level of 600 ppm due to CO₂ fertilization but positive impact will be neutralized by the increase in temperature. Therefore, different models have predicted the reduction in yield potential range from 5.9 – 6.5 per cent in 2020 and 10.0 – 13.1 per cent by 2055. Further, the increase in temperature has shortened the seed production window due to early appearance of aphids. Outbreak of certain sucking pests such as white flies and thrips also leads to seed material degeneration.

Indirect effects of climate change : North-western plains receive some winters rains due to westerly disturbance that are useful for *rabi* crops including potato. The winter and post monsoon seasons are likely to be more affected by warming. Therefore, potato in addition to direct effects on growth and yield, may be subjected to indirect effects of warming. These are increasing drought due to reduction in precipitation, enhanced salinity problems and unpredictable extreme climate events like erratic unseasonal rains, flooding, frosting etc.

Adaptation/Mitigation to Climate change

(a) **Genetic manipulations :** ● Breeding short duration and heat tolerant cultivars ● Breeding drought and salinity tolerant cultivars

(b) Agronomic manipulations

- Use of protected structures such as net house technology for healthy seed multiplication.
- Use of wind breaks around fields and crop residue mulches for some period after planting.
- Using drip irrigation in place of furrow and basin methods.
- Application of fertilizers with irrigation (fertigation technique).
- Conservation tillage and on farm crop residue management.
- Use of various crop growth simulation models for predicting the potential impact and identifying new areas for potato cultivation

General awareness : Strengthen education, research and development in warm climate production technology for ware and seed potato crop.

*Dr. J.S. Minhas, Head ICAR-CPRS, Jalandhar (PB). has about 36 years of experience in potato. He had worked on physiology of drought and heat tolerance and has released a heat tolerant potato variety Kufri Surya. He is also studying the impact of climate change on potato production and seed quality parameters. He has received many awards including the prestigious "ICAR award for outstanding interdisciplinary team research"