ABSTRACT

In the present investigation, canola (*Brassica napus* L.) and sunflower (*Helianthus annuus* L.) cultivars (two each) were grown in pots during the two successive growth seasons of 2001-2003 at three widely separated sites viz., Botanic Garden, GC University, Lahore (urban site: BG); Rakh Dera Chahl, Lahore (remote rural site: RDC), and Kala Shah Kaku, Sheikhupura (roadside rural site: KSK), using 400 ppm concentrations of an antiozonant chemical "N-[2-(2-oxo-1-imidagolidinyl)ethyl]-N2-phenylurea" or EDU as soil drench (EDU-SD) and foliar spray (EDU-FS) after 10-days interval including non-EDU treated (NEDU) as control, and also monitoring the climatic conditions along with phytotoxic pollutants like O_3 and NO_2. Crop growth, pigments, biochemical attributes, biomass, yield and nutritional quality of both crops were measured during experimentation.

The prevailing climatic conditions were slightly different during two crop seasons of canola and sunflower for temperature (20-25°C), light levels (30-38 kilolux) and relative humidity (52-59%). Seasonal mean 8 h O_3 concentration showed gradual increase during growth season of canola (65, 74, and 81 ppb) and sunflower (74, 85 and 91 ppb) at BG, KSK, and RDC sites respectively. However, mean NO_2 concentrations during both consecutive seasons were more or less similar with approximately 56 ppb, 48 ppb and 5 ppb in above-referred to sites respectively.

EDU-SD treatment proved highly effective than EDU-FS when compared with NEDU in the case of both crops. There were highly pronounced increases in EDU-SD treatment plants for various parameters like plant height (30-60% for canola, and 6-20% for sunflower), number of leaves per plant (6-16% for canola, and 10-48% for sunflower), chlorophyll contents (19-88% for canola, and 10-42% for sunflower), carotenoids (23-74% for canola, and 11-19% for sunflower), soluble carbohydrates (3-36% for canola, and 6-26% for sunflower), soluble proteins (19-36% for canola, and 11-30% for sunflower), plant fresh weight (127-181% for canola, and 25-113% for sunflower), plant oven dry weight (101-130% for canola, and 59-163% for sunflower), leaf area (43-75% for canola, and 9-46% for sunflower), leaf water contents (8-27% for canola, and 7-11% for sunflower), seed yield (56-83% for canola, and 38-71% for sunflower), and seed oil contents (6-17% for canola, and 9-17% for sunflower) when compared with counterparts from NEDU during successive experimental seasons.

On the other hand, rate of senescence of leaves remained lower in EDU-SD than that of NEDU in both crops. Similarly, significant reductions were noted in total free amino acid (20-45% for canola, and 13-26% for sunflower), proline contents (16-39% for canola, and 16-40% for sunflower), erucic acid (6-23% for canola, and 6-9% for sunflower), and glucosinolate contents of seed meal (6-26% for canola, and 20-28% for sunflower) in EDU-SD plants than NEDU. The results imply that ozone may be causing significant crop losses in rural areas around Lahore; however, the geographical extent of the problem, and the implications for peri-urban agriculture around other cities of south Asia are uncertain.