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‘Ground ozone has hit crop yield’

Neha.Madaan@timesgroup.com

Pune: Ground ozone is affecting crop yield across the country, with wheat being the worst hit. Maharashtra stands on top of the list of states where the percentage yield of wheat has been impacted the most.

Researchers said the countrywide collective crop yield loss to ozone in India was sufficient to feed about 94 million people living below the poverty line.

The study was conducted by city-based Indian Institute of Tropical Meteorology (IITM), National Center for Atmospheric Research, Boulder, Colorado, and University of California, San

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Diego, USA. Its findings were published a month ago.

Researchers took the year 2005 as the representative year for the first decade of the 21st century.

The study found wheat to

be the most affected crop, with losses of around 3.5 million tonne, followed by rice at 2.1 tonne. The losses were concentrated in central and north India.

Ground level ozone, often called “bad” ozone, is not released directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight, researchers explained.

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Surface ozone emerges as new threat to crop yield, finds study

Wheat Found To Be Most Affected

Neha.Madaan@timesgroup.com

Pune: Surface ozone is impacting crop yield across the country, a recent study has found. Wheat was found to be the most affected crop, with ozone-induced percentage loss in yield highest in Maharashtra.

The study conducted by city-based Indian Institute of Tropical Meteorology (IITM), National Center for Atmospheric Research, Boulder, Colorado, and University of California, San Diego, USA was published last month. It assessed the potential impact of ozone on district-wise cotton, soybean, rice, and wheat crops in India for the first decade of the 21st century. It found that the countrywide collective crop yield loss to ozone in India was sufficient to feed about 94 million people living below poverty line.

Researchers said the study's findings should be

EXTENT OF DAMAGE

Crop	Commodities production	Production loss	Fractional loss	Economic damage
Cotton	3.3	0.17	5.3%	0.07
Soybean	8.6	0.23	2.7%	0.06
Rice	95.1	2.1	2.1%	0.54
Wheat	71	3.5	5.0%	0.62

used by policy makers to implement effective emission control measures to bring down surface ozone level.

The study focused on the year 2005, which researchers found to be representative for the first decade of the 21st century. Wheat was found to be the most affected crop, with losses of around 3.5 million tonne, followed by rice at 2.1 tonne. The losses were concentrated in central and north India.

In case of the top 10 wheat and rice producing states in India, ozone-induced percentage loss of wheat was found to be the highest in Maharashtra (17%) followed by Madhya Pradesh (8%), Gujarat (8%), West Bengal (6%), and Uttaranchal (5%). In terms of weight, greatest loss of wheat

was seen in Uttar Pradesh (0.6 tonne) and Madhya Pradesh (0.5 tonne), which was about 32% of total wheat lost in India during 2005.

Ground level ozone, often called “bad” ozone, is not released directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight.

Continuous exposure to enormous concentrations of surface ozone damages vegetation, adversely affects crop yield and crop quality. This is especially worrisome for an agricultural country like India, which has seen an unprecedented increase in ozone-precursor gases such as NOx, Carbon monoxide (CO), and VOCs, which in turn increase

WHEAT LOSS

In percentage	In weight
Maharashtra 17	Uttar Pradesh 0.6 tonne
Madhya Pradesh 8	Madhya Pradesh 0.5 tonne
Gujarat 8	
West Bengal 6	
Uttaranchal 5	

transport model, latest multiple emission inventories, and district-wise crop production datasets.

“Ozone-induced percentage loss of rice is between 1 and 3% (0.1-0.3 tonne) in case of major rice-producing states like West Bengal, Orissa, Andhra Pradesh, and Uttar Pradesh. It is maximum in Punjab, where the loss is up to 0.8 tonne, which is more than 8%. When compared to wheat loss, rice loss is greatest in Punjab. During rice-growing season, ozone levels are fairly high in Punjab due to increase in solar radiation and ozone precursors concentrations associated with a change in wind patterns,” said Ghude.

Ghude said that the study provides firsthand information to policy makers to propose emission control of ozone precursors to make national food production more secure.

“These results may have important policy implications for India where surface ozone is expected to increase in the future due to increasing precursor emissions and the implementation of the National Food Security Bill,” said Ghude.

levels of surface ozone. Vehicular and industrial pollution cause an increase in gases NOx, CO, and VOCs.

“Climate change can further worsen the situation as it has been shown to increase ozone in many regions of the world. There are currently no air quality standards to protect agriculture from ground level ozone in India. Intergovernmental efforts to raise awareness for the need for ozone standards are still to be successful in gaining political support for efforts to reduce threats posed by ground level ozone on agriculture,” said Sachin Ghude, lead researcher and scientist at IITM.

Researchers estimated the potential reductions in crop yield due to ozone exposure using a regional chemistry