

Antibiotics for food crops

August 25, 2020

The threat of antimicrobial resistance to humans is already a cause of concern. With the more usage of antibiotics to grow food crops aggravates the problem. Hence a detailed study is needed to know the ill effects of this problem and remedies to be suggested.

In news The Registration Committee (RC) under CIBRC has recommended that use of antibiotics streptomycin and tetracycline be completely banned.

Placing it in syllabus Biotechnology

Dimensions

- What are streptomycin and tetracycline?
- Effects of them on food crops
- Why ban?

Content

What are streptomycin and tetracycline?

- Streptomycin is an aminoglycoside antibiotic.
- It irreversibly binds to the **16S rRNA and S12 protein** within the bacterial 30S ribosomal subunit.
- As a result, this agent interferes with the assembly of initiation complex between mRNA and the bacterial ribosome, thereby **inhibiting the initiation of protein synthesis.**
- It is **used to treat a number of bacterial infections** like tuberculosis, Brucellosis, Plague, and rat bite fever.

Tetracyclines:

- These are broad spectrum antibiotics **obtained from Streptomyces strains.**
- Tetracycline **inhibits protein synthesis by blocking the attachment of charged aminoacyl-tRNA to the A site** on the

ribosome.

- Tetracycline **binds to the 30S and 50S subunit** of microbial ribosomes.
- Thus, it **prevents introduction of new amino acids to the nascent peptide chain.**
- It is used to treat infections caused by bacteria including pneumonia and other respiratory tract infections, certain infections of skin, eye, lymphatic, intestinal, genital and urinary systems.

Effects of them on food crops:

- The indiscriminate use of both antibiotics may lead to the development and spread of **antimicrobial resistance (AMR)**.
- **When used in crops**, unspent antibiotics **find their way into the surrounding environment.**
- **Microorganisms** exposed to this increasing load of antibiotics in soil and water can **develop resistance to it.**
- The resistance can spread to other bacteria through transfer of genetic material.
- When humans or animals get infected by such resistant microorganisms, their **treatment becomes difficult as well as expensive.**
- There is a possibility that **traces of antibiotics remain in edible parts of the plant** long after streptocycline is sprayed, affecting human health or making them resistant to the antibiotics.




Why ban?

- According to the research conducted by Delhi-based **Centre for Science and Environment (CSE)** in states of Delhi, Punjab, Haryana, Maharashtra, Andhra Pradesh and Himachal Pradesh **none of the farmers know that streptocycline is a combination of antibiotics** and are routinely using it as any other pesticide.

- According to CIBRC, streptocycline should be used when plants develop bacterial infections like leaf blight, fire blight, citrus canker, rotting of fruits and stems. But CSE research has found the **farmers using it even in the absence of disease symptoms.**
- Many farmers mix fungicides with streptocycline before spraying as they are **unable to distinguish fungal or bacterial diseases.** Some farmers use **concentration that is three to four times higher** than what is recommended.
- Many **Krishi Vigyan Kendras (KVK)s recommend streptocycline on crops not listed for use** by CIBRC.

WHAT'S THE NORM ANYWAY?

Streptocycline is used on a large number of crops despite Central insecticide board (CIBRC) allowing its use on eight

Recommended use on crops and for disease	Used but not recommended by CIBRC	Not recommended by CIBRC but by KVK*
 Bean (halo blight), potato (blackleg and soft rot, bangle disease), tea (blister blight), tobacco (wildfire) and tomato (bacterial leaf spot)	Apple gourd, bottle gourd, brinjal, cabbage, carrot, cauliflower, chenopodium, chilli, coriander, cucumber, fenugreek, garlic, gram, lady finger, onion, radish and spinach	Betel vine, brinjal cabbage, cauliflower, onion and ginger
 Apple (fire blight) and citrus (citrus canker)	Grape, mango and pomegranate	Banana, mango, pomegranate, and watermelon
 Paddy (bacterial leaf blight)	Mustard	Gram and sesame

Source: Central Insecticide Board and Registration Committee; *Krishi Vigyan Kendra

- The key drug regulator of the country, the **Central Drugs Standard Control Organisation (CDSCO)**, does not have any role in regulating antibiotics used on crops.
- **Antibiotics meant for plants** or crops do **not fall within the purview of Drugs and Cosmetics Act (D&C Act), 1940.**
- State drug authority cannot exercise any control over companies that manufacture or sell antibiotics for use in crops as they manufacture and sell the product as

pesticides.

- **CIBRC has wrongly registered streptocycline as a fungicide** and is **assigned low toxicity**, meaning no special precaution needs to be taken for its use. But this labelling does not consider health hazards like AMR.
- The **Food Safety and Standards Authority of Indian (FSSAI)** does not provide any separate tolerance limit for streptocycline in food products.
- Hence the CIBRC based on the registration committee report recommended a ban with immediate effect on crops where other options were available for bacterial disease control.
- The **report recommended that streptomycin and tetracycline use be phased out by 2022-end** for crops for which no alternatives were available.
- **Till then, the antibiotics could be used on crops strictly as per the label claim.**

With this ban / phase-out, misuse of streptomycin and tetracycline in crops for which it was not approved will be checked. This will also help plug gaps such as registering them in the name of pesticides or using them in an unregulated fashion in the absence of prescription.

About CIBRC:

- Based on the recommendations of Expert Committee headed by **Prof. M.S. Thacker**, a comprehensive **Insecticides Act was passed in 1968** to regulate the import, manufacture, sale, transport, distribution and use of insecticides.
- The enforcement of Act was transferred to the **Ministry of Agriculture** in the year 1970 by the Ministry of Health and family Planning.
- All the provisions of the Insecticides Act were brought

into force with effect from 1st August, 1971.

- In the Act, there is **compulsory registration of the pesticides at the Central level and licence for their manufacture, formulation and sale are dealt with at the State level.**
- For the effective enforcement of the Insecticides Act, 1968, the two bodies have been constituted at the Central level namely Central Insecticides Board and Registration Committee.

What needs to be done?

- A recently released report by the FAO and WHO has recommended **integrated pest management as an effective approach** to limit the use of antimicrobials in crops.
- Hence, antibiotics, which are drugs meant for treatment of bacterial diseases in humans **should not be used as pesticides** and be used under expert supervision only after a bacterial disease has been diagnosed in a crop.
- **CIBRC should reclassify streptocycline as an antibiotic** and ensure that it is not sold as fungicide or pesticide.
- All the other uses of antibiotics should be considered as misuse and phased out.
- **CDSCO needs to consider amending the D&C Act** to bring antibiotics used in plants as “drugs” under its purview.
- The Ministry of Agriculture and Farmers Welfare (MoAFW) should work towards strengthening the extension machinery and creating awareness among farmers, dealers and extension officers towards limiting antibiotic misuse in crops.
- MoAFW should introduce the concept of “**plant health experts**” and train them to help farmers with disease diagnosis and use of inputs.
- ICAR should engage in **research and development of effective and low-cost alternatives** to antibiotics.
- FSSAI should come out with **separate tolerance limits for**

streptocycline in food and conduct surveillance for monitoring antibiotic residues in plant-derived food.

Mould your thought Critically analyse the usage and effects of antibiotics on crops.