

PESTICIDE TYPE	FUNGICIDE
Chemical Class	Tetrazolyloxime
Common Trade Names	Vayantis, Picarbutrazox
Major Degradates	TZ-1E; TZ-2; TZ-5; TT-3; TZ-2E; TY-2
Application Rate (lb a.i./A)	Max Single: 0.33 (turf) Max Annual: 1.32 (turf)
Registration Status	EPA: Registered unconditionally in March 2021 Minnesota: 2021
Toxicity Profile for Applicators	Signal word: CAUTION Toxicity Categories III and IV (oral, dermal, and inhalation exposure)
Basic Manufacturer(s)	Nippon Soda Co. Ltd. Syngenta Crop Protection LLC
MDA Laboratory Capabilities	In discussion
HUMAN HEALTH	
Non-Cancer	Acute PAD = no value* Chronic PAD = 0.13 mg/kg/day
Cancer	Suggestive Evidence of Carcinogenic Potential
<i>Acute and chronic population adjusted doses (PAD) are doses that include all relevant uncertainty and safety factors.</i> * A toxicological endpoint attributable to a single dose was not identified.	
ENVIRONMENTAL AQUATIC TOXICITY	
Fish	Acute: >145 ppb Chronic: 19 ppb
Invertebrate	Acute: >140 ppb Chronic: 130 ppb
Aquatic Plants	Vascular: >314 ppb Non-vascular: >271 ppb
POLLINATOR TOXICITY	
Honey Bee (adult)	Acute Contact: >38.7 µg ai/bee Acute Oral: >38.7 µg ai/bee
<i>Level of Concern (LOC) has been applied to all values.</i>	

INTRODUCTION

Picarbutrazox is a new fungicide active ingredient that was recently registered by the U.S. Environmental Protection Agency (EPA) for use on corn, soybean, and turf. It has a new mode of action and is classified by the Fungicide Resistance Action Committee (FRAC) as group U17, though the details of how it functions are unknown. Picarbutrazox is registered as a seed treatment for corn and soybeans to control seed and seedling diseases caused by *Pythium* and *Phytophthora* species. On turf, it is registered for use to control *Pythium* diseases (foliar blight, damping-off, root dysfunction). Approved turf use sites include golf courses, sports fields, residential and commercial lawns, sod farms, turf seed farms, cemeteries, recreational areas, and parks. Picarbutrazox can be applied to turf by ground, aerial, and chemigation equipment, depending on the use site. Applications to residential lawns must be made by professional applicators.

The Minnesota Department of Agriculture's (MDA) extensive review of the EPA picarbutrazox labels and risk assessments for issues relevant to Minnesota is summarized below.

PROJECTED USE IN MINNESOTA

According to experts at the University of Minnesota, widespread use of picarbutrazox for turf is not expected, but it may be useful in certain situations. For example, picarbutrazox could be useful for golf course superintendents if they are establishing seeded creeping bentgrass greens when high temperatures are possible. Picarbutrazox is also expected to be used as a seed treatment in corn and soybeans in Minnesota; however, anticipated levels of use are unknown and alternative fungicide active ingredients are available. As a new active ingredient, picarbutrazox will likely be valuable for resistance management in the long term. The MDA is not aware of any field trials involving picarbutrazox conducted by the University of Minnesota Extension.

For turf use, the maximum single application rate is 0.33 lb a.i./A with up to four applications per year. The maximum seed treatment application rate is 0.010 lb a.i./100 lb seed, and use must not result in more than 0.17 lb a.i./A per year.

Two end-use products containing picarbutrazox are currently registered by the EPA (listed below). Note that only Vayantis has been registered for use in Minnesota at the time of this review.

- **Picarbutrazox 20WG** (EPA Reg. No. 8033-138) – This product is a wettable granule containing 20% picarbutrazox and is intended for use on commercial turf.
- **Vayantis** (EPA Reg. No. 100-1635) – This product is formulated as a flowable concentrate containing 36% picarbutrazox and is intended for seed treatment of corn and soybeans.

LABEL ENVIRONMENTAL HAZARDS

Water Quality

This product may impact surface water quality due to runoff of rainwater. This is especially true for poorly draining soils and soils with shallow groundwater. This product is classified as having a medium potential for reaching both surface water and aquatic sediment via runoff for several months or more after application.

Other Restrictions

- Do not use for at-plant applications (Vayantis).
- Do not apply when wind speeds exceed 10 mph at the application site (Picarbutrazox 20WG).
- Applicators must select nozzles and pressure that deliver medium droplets (Picarbutrazox 20WG).

TOXICOLOGY AND EXPOSURE

EPA's screening models generate high-end, conservative exposure estimates for active ingredients and toxicologically significant degradates. Model inputs include annual usage at maximum use rates, maximum treated acres, maximum food residues, peak runoff, drift scenarios, etc. Some proposed products, application rates, and use scenarios are not relevant to Minnesota. EPA's estimates, therefore, may not reflect future use and impacts in Minnesota.

Human Health

- **Carcinogenic Effects** – Picarbutrazox is classified by the EPA as having “suggestive evidence of carcinogenic potential.”
- **Drinking Water Guidance** – Picarbutrazox and three of its degradates (TZ-1E, TZ-2, TZ-5) were considered to be residues of concern in drinking water in the EPA's dietary (food + water) risk assessment. Chronic dietary risk estimates for picarbutrazox, which also account for its potential carcinogenicity, were below levels of concern for all populations. An estimated drinking water concentration (EDWC) of 2.56 µg/L was used based on modeled concentrations in surface water from turf application.
- **Occupational Exposure** – All exposure scenarios assessed by the EPA resulted in risk estimates not of concern. A restricted entry interval of four hours is set for both seed treatment and turf use.

Non-target Species

- **Stressor** – The parent, picarbutrazox, and TZ-1E are the residues of concern identified by EPA.
- **Aquatic Life Exposure** – Picarbutrazox is classified by EPA to be at most highly toxic to freshwater fish and invertebrates on an acute basis (available studies did not derive an endpoint). Risks to aquatic plants were below the EPA's levels of concern.

- **Terrestrial Life Exposure** – Picarbutrazox is practically non-toxic to birds and mammals on an acute exposure basis, and the risk to terrestrial plants is thought to be low.
- **Pollinators** – Picarbutrazox is practically non-toxic to young adult and larval honey bees on an acute contact and oral exposure basis.

ENVIRONMENTAL FATE

Picarbutrazox is slightly to moderately persistent based on observed aerobic soil metabolism half-lives; however, it is rapidly transformed to TZ-1E (an isomer of picarbutrazox) through photolysis. Major routes of degradation include hydrolysis, photolysis, and microbial degradation. Picarbutrazox is slightly mobile in soil and leaching is unlikely. Possible routes of exposure include spray drift, runoff, and erosion.

Soil

- **Half-life** – Aerobic: 35 to 73 days
Anaerobic: no data
- **Mobility** – K_{oc} values range from 1530 to 5849 L/kg_{oc}
Solubility in water (20°C) is 0.33 mg/L
- **Photolysis Half-life** – 44 days (picarbutrazox + TZ-1E)
- **Persistence** – DT_{50} values range from 93 to 239 days (picarbutrazox + TZ-1E)

Aquatic

- **Half-Life** – Aerobic: 86 and 51 days
Anaerobic: 21 and 32 days
- **Photolysis Half-life** – 1.7 to 2.1 days (picarbutrazox + TZ-1E)
- **Hydrolysis Half-life** – 0.51 to 24.3 days (strong dependence on pH and temperature); 21 days at pH7, 25°C

Air

- **Volatilization** – Not a major route of dissipation.
Vapor pressure (25°C): 1.2 x 10⁻⁷ torr;
Henry's law constant: 8.01 x 10⁻⁶

Degradates

TZ-1E is a major degradate and isomer of picarbutrazox that forms rapidly through photolysis and has a similar toxicity as the parent. TZ-2 and TZ-5 were major degradates in the aerobic aquatic studies submitted to the EPA and were found to be more persistent than picarbutrazox. Both degradates were also observed in anaerobic soil studies. TZ-2 is considered slightly mobile in soil. Other major degradates include TT-3, TZ-2E, and TY-2.