



PCNB

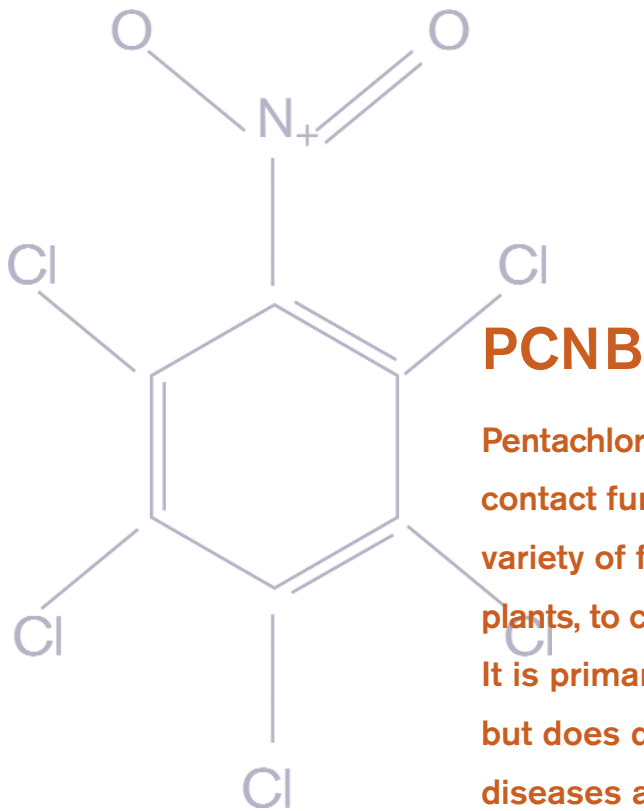
A fungicide used for a wide variety of field crops and turf and ornamental plants.





Pentachloronitrobenzene (PCNB)

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Pentachloronitrobenzene (PCNB) is a broad spectrum, contact fungicide used for disease control on a wide variety of field crops, as well as turf and ornamental plants, to control diseases caused by fungal pathogens. It is primarily effective against soil-borne pathogens, but does display some efficacy against foliar diseases as well. Due to PCNB's non-systemic nature, PCNB must be present on the plant or in the soil prior to the onset of infection to be effective.

PCNB has been registered for use since the mid-1950's. PCNB fungicide is sold under the Blocker™ and Par-Flo® trademarks in various formulations by AMVAC Chemical Corporation. PCNB is a versatile product and may be applied by several methods including transplant solutions, row drench, in-furrow at planting and in foliar sprays.

It is also commonly used as a seed treatment fungicide. In-furrow banded treatment at planting is the most common method of application on the crops registered.

Features and benefits

PCNB controls or suppresses a wide range of plant diseases. It is a contact fungicide with multi-site activity. PCNB forms a protective zone around plant roots and stems, thus protecting them from disease development.

Diseases controlled or suppressed

Clubroot (*Plasmodiophora brassicae*)
Wire Stem or Black Rot (*Corticium solani*)
Root/Stem Rot /Stem Canker/Black Scurf (*Rhizoctonia solani*)
White Mold (*Sclerotinia sclerotiorum*)
White Rot (*Sclerotium cepivorum*)
Southern Blight (*Sclerotium rolfsii*)
Anthracnose/Black Dot (*Colletotrichum coccodes*)
Common Scab (*Streptomyces scabies*)
Gray Snow Mold (*Typhula* spp.)
Pink Snow Mold (*Microdecum nivale*)
Leaf Spot (*Drechslera* spp.)

PCNB products are registered on many crops

Beans (dry, snap or succulent)
Broccoli
Brussels Sprouts
Cabbage
Cauliflower
Chinese Broccoli
Chinese Cabbage (tight-headed varieties only)
Collards
Cotton
Garlic
Kale
Mustard Greens
Peanuts
Peppers
Potatoes
Tomatoes



Formulations

PCNB is available in several convenient formulations to fit your specific needs. Both Blocker™ and Par-Flo® are available in 4 lb. per gallon flowable and 10% granular formulations. PCNB is also available as a 75% wettable powder formulation, primarily for turf and ornamental uses.

Use rates and guidelines

PCNB use rates range from 0.75 to 5 lbs. active ingredient per acre depending on crop and application method. Turf rates range from 0.5 to 0.75 lbs. active ingredient/1000 sq. ft. and transplant solution rates range from 0.75 to 3.75 lbs. active ingredient per 100 gallons of water. PCNB is an excellent tank mix partner with other popular crop, turf and ornamental protection fungicides. It is the foundation or base for disease control in these applications. It is most often tank-mixed or used sequentially with other approved fungicides to increase efficacy and to decrease resistance development of single-site mode of action products.

TOXICOLOGICAL INFORMATION

Summary of acute and chronic toxicity data for terrestrial organisms

Species	LD ₅₀ (ppm)	Acute Oral Toxicity	5-Day LC ₅₀ (ppm)	Subacute Dietary Toxicity	Chronic Toxicity NOEC*/LOEC** (ppm)	Affected Endpoints
Northern bobwhite quail	>2250	Practically non-toxic	>5620	Practically non-toxic	600 / 1200	reproduction
Mallard duck	–	–	>5620	Practically non-toxic	600 / 1200	growth
Honey bee	>0.1 (mg/bee contact)	Practically non-toxic	–	–	–	–
Laboratory rat	>5050 (mg/kg)	Practically non-toxic	–	–	10 / 100	–

*No Observed Effect Concentration

**Lowest Observed Effect Concentration

Summary of acute and chronic aquatic toxicity

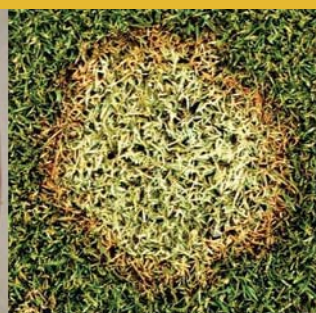
Species	96-hr LC ₅₀ (mg/L)	Acute Toxicity	Chronic Toxicity NOEC/LOEC (mg/L)	Affected Endpoints
Rainbow trout	0.32	highly toxic	0.013 / 0.032	growth
Bluegill sunfish	0.10	highly toxic	–	–
Sheepshead minnow	7.9	moderately toxic	0.027 / 0.054	growth
Eastern oyster	0.023	very highly toxic	–	–
Mysid shrimp	0.012	very highly toxic	–	–



Common Scab in Potatoes



Rhizoctonia Black Scurf



Pink Snow Mold in turf



Rhizoctonia Stem Canker

Mode of action

PCNB is listed as a lipid and membrane synthesis inhibitor with the Fungicide Resistance Action Committee.

- PCNB breaks down into CO₂, which inhibits the uptake of oxygen by the disease spore and either kills the fungus or prevents it from germinating by blocking the metabolic pathway (anti-sporulation).
- PCNB also interrupts the metabolic pathway of a soil-borne pathogen by blocking the pentose phosphate shunt, the entry of pyruvic acid into the Krebs cycle, and glucose formation in general.

Due to multi-site modes of action, no known resistance by any pathogen to PCNB has been documented.

Chemical and physical properties

Appearance	Crystals from alcohol; colorless needles; fine needles from alcohol, platelet from carbon disulfide
Chemical Name	Pentachloronitrobenzene
CAS Number	82 68 8
Molecular Weight	295.36
Molecular Formula	C ₆ Cl ₅ NO ₂
Water Solubility	Approximately 0.4 ppm
Melting Point	142°–145° C
Half-Life in Water	1.8 days
Half-Life in Soils	Approximately 80 days

Toxicological information

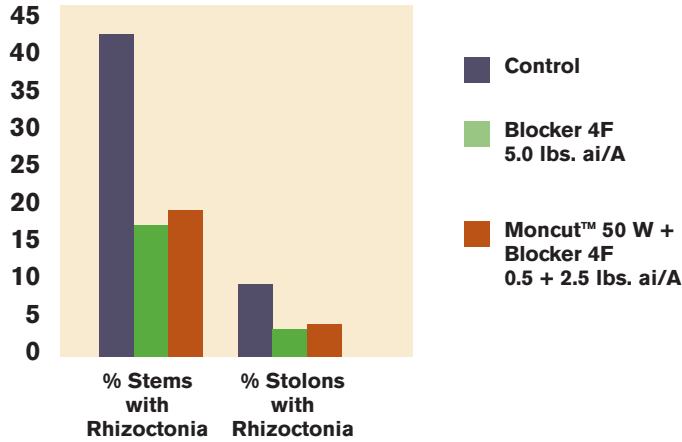
PCNB has low acute toxicity with study results placing PCNB in Toxicity Categories III or IV (Signal Word CAUTION), although one study has identified PCNB as a weak skin sensitizer. Subchronic and chronic studies indicate that the thyroid and liver are the target organs for PCNB toxicity. Increases in the thyroid stimulating hormone (TSH) and thyroid and liver hypertrophy suggest that the thyroid effects may be due in part to a disturbance of thyroid homeostasis. PCNB has generated thyroid tumors in the rat via this mechanism in a two year study and therefore has been classified as a Group C – possible human carcinogen. There is however no evidence of genotoxic potential from a range of in-vivo and in-vitro studies that have been carried out. PCNB does not cause reproductive, teratogenic or developmental effects in rats or rabbits. In addition, there is no indication of any neurotoxicological effects from the extensive toxicological database of studies that have been performed.

PCNB for disease control in potatoes

PCNB products are the base for many soil-borne and foliar disease control programs in potatoes. PCNB use labels for potatoes have been expanded over the last several years to allow use of this valuable tool in a variety of potato applications. The in-furrow application label for Blocker was recently expanded to add suppression of common scab and black dot to the existing Rhizoctonia control label. Additionally, Blocker may be tank-mixed with other registered fungicides and applied via chemigation to suppress white mold (*Sclerotinia sclerotiorum*) and black dot (*Colletotrichum coccodes*) in potatoes grown in the Pacific Northwest under Special Local Need Registrations.

The Effect of Blocker 4F on Potato Stems and Stolons Infected with Rhizoctonia Solani

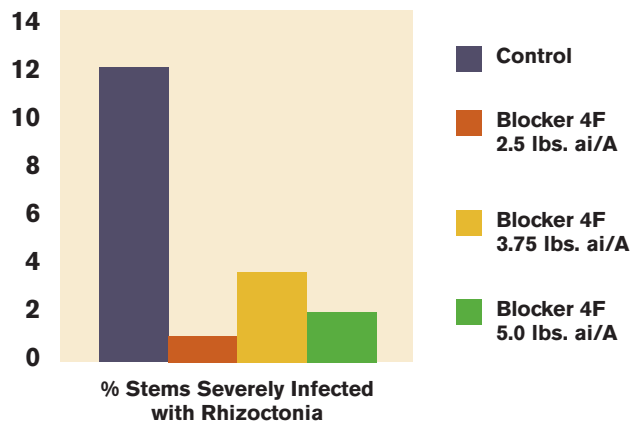
Colorado State University, 2001



PCNB is considered a "standard" treatment for controlling Rhizoctonia solani in many crops. It is most often used as the "base" treatment in conjunction with seed treatments and/or other fungicides for controlling Rhizoctonia and other soil and seed-borne pathogens. The above graph displays the effectiveness of Blocker 4F alone in controlling Rhizoctonia solani on potato stems and stolons, and also displays the flexibility and added efficacy of the product when used in combination with other registered products.

The Effect of Blocker 4F on Snowden Potato Stems Severely Infected with Rhizoctonia Solani

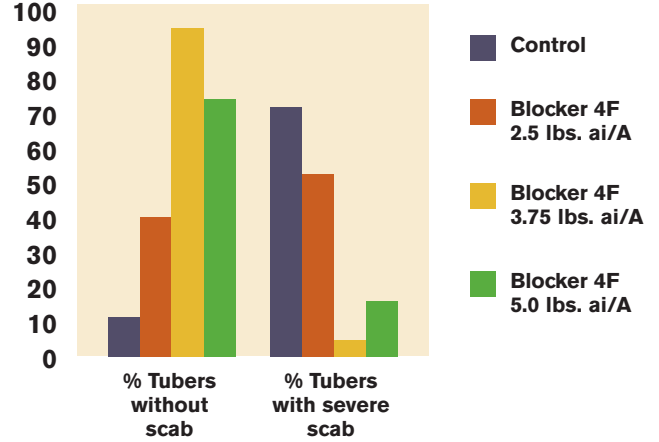
Stevens Point, WI, 2001



The above data display the diversity in use rates of Blocker 4F for decreasing the severity of Rhizoctonia infection on potato stems.

The Effect of Blocker 4F on Snowden Potato Tubers Infected with Common Scab

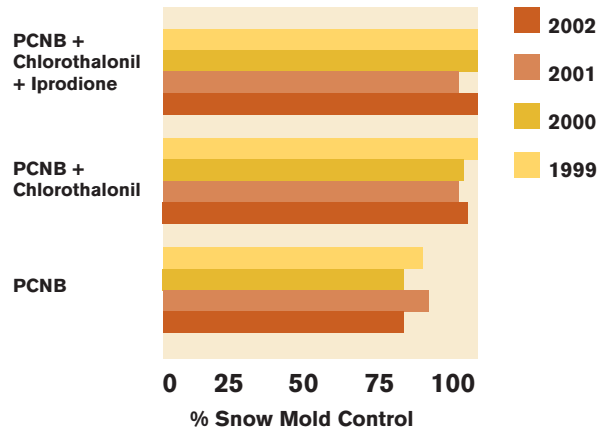
Stevens Point, WI, 2001



Blocker 4F also displays excellent suppression of common scab infection on potato tubers and greatly reduces the severity of scab on the tubers as displayed above.

PCNB Provides Consistent Control of Snow Mold

Michigan State University



PCNB products are the cornerstone for snow mold control in turf.

PCNB products have been tested for over 50 years by university and private researchers and consistently rank at or near the top in those studies. PCNB must be applied in the fall, before snow cover begins. The product controls both grey (Typhula spp.) and pink (Microdecum nivale) snow mold. Combining PCNB with other active ingredients has been documented to provide enhanced snow mold protection, and no snow mold resistance to PCNB has been documented during that extended period.

In Michigan State University turf trials over four years (above), PCNB alone displayed good control of snow mold, but improved control was noted when combinations with other products were utilized. The increase in efficacy is important, but combinations of fungicides also decrease the potential for resistance development of any pathogen to any group of fungicides. Furthermore, even the highest recommended use rates of PCNB on turf will not harm beneficial mycorrhizae.

 **PCNB 75%**

 **BLOCKER™**

PAR-FLO® 4F



For more information about PCNB, contact your local agricultural chemical retailer, call **1-888 GO AMVAC** (1-888-462-6822) or visit www.amvac-chemical.com.

Photo of potato field courtesy of James Luzader, USDA NRCS

Always read and follow all label directions and use precautions. Always pre-test for phytotoxicity prior to large-scale use.

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