



# BEAR RIVER **ZEOLITE** BRZ™

## Cannabis Research Review

This document was prepared to provide information from third party clinoptilolite research studies. Benefits from studies cannot be claimed by Bear River Zeolite, Co. due to U. S. and Canadian government restrictions.

### Clinoptilolite amended soil has shown:

- 7% average cannabis growth increase by weight
- 110% increase in total cannabinoid potency
- 50% reduction in watering
- 50% reduction in the cost of water and watering labor



Medicinal marijuana

### Improve cannabis growing mixes

- Retains nutrients and moisture, releasing them as needed by the plant
- Provides aeration and drainage
- Reduces the drying rate of soils
- Buffers soils with calcium
- Loosens soil for better seed and root development
- Durable and won't break down
- 50% reduction in fungal species
- Supports beneficial micro-organisms



Seedlings



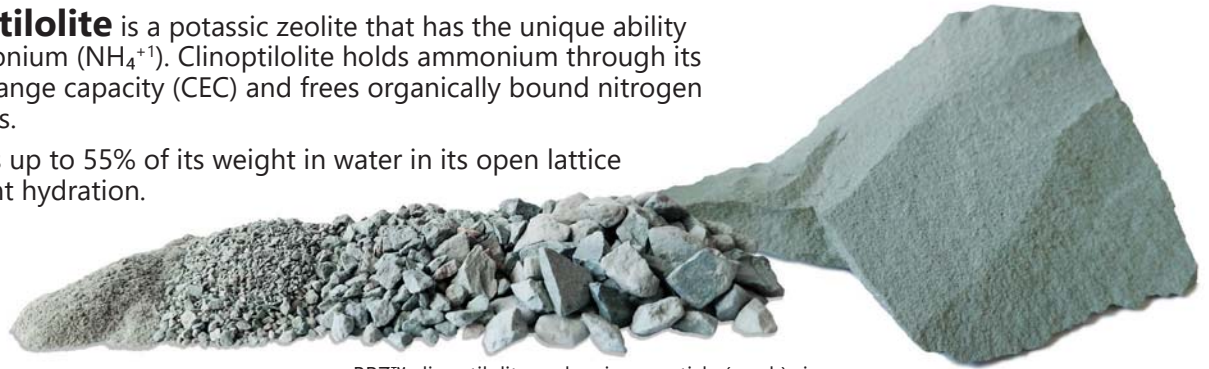
Commercial recreational marijuana greenhouse



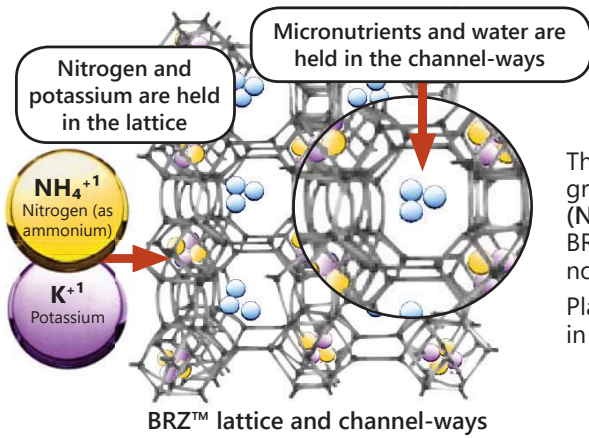
# BEAR RIVER ZEOLITE BRZ™

**BRZ™ clinoptilolite** is a potassic zeolite that has the unique ability to capture ammonium ( $\text{NH}_4^{+1}$ ). Clinoptilolite holds ammonium through its high cation exchange capacity (CEC) and frees organically bound nitrogen (energy) to plants.

BRZ™ also stores up to 55% of its weight in water in its open lattice channels for plant hydration.



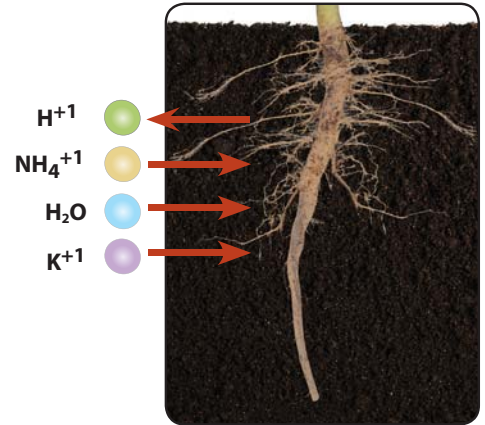
BRZ™ clinoptilolite and various particle (mesh) sizes



## How it works

The plant releases **hydrogen ( $\text{H}^{+1}$ )** during growth, which exchanges with **ammonium ( $\text{NH}_4^{+1}$ )** and **potassium ( $\text{K}^{+1}$ )** held in the BRZ™ lattice, which is plant accessible but not water soluble.

Plant available **water ( $\text{H}_2\text{O}$ )** is loosely held in the open pore spaces of the BRZ™.



Cannabis root

## Specifications

Clinoptilolite	>90%
Potash	4.19% (plant available but not water soluble)
Calcium	1.60 - 2.02% which is a pH buffer and plant nutrient
Sodium	<0.5% (not water soluble)
CEC (Cation Exchange Capacity)	190 to 220 meq/100 gram (as ammonium N <sup>-</sup> )
Surface Area	High surface area, 24.9 square meters/gram
Water Retention (maximum)	Absorbs up to 55% of its weight in water
Bulk Density	Approximately 55 - 60 pounds per cubic foot
pH	8.64
Specific Gravity	2.1 - 2.2 gm/cc
Hardness	Low clay, hard (Mohs No. 3), abrasion resistant

### General directions:

Thoroughly mix 2 to 3 pounds BRZ™ with 10 pounds of soil. Preload BRZ™ with water to create a moisture reservoir.



OMRI listed (Class: Mined minerals-unprocessed, Crop Fertilizers and soil Amendments, No.: ber-3083)  
GRAS classification (generally regarded as safe), non-toxic

### REFERENCES CITED

Andronikashvili, T., Urushadze, T., Eprikashvili, L., Gamisonia, M., and Nakaidze, E. 2008. Towards the biological activity of the natural zeolite-clinoptilolite-containing tuff. Bulletin of Georgian Natl. Acad. Of Sci. 2(3).

de Campos Bernardi, A.C., Polidoro, J.C. de Melo Monte, M.B., Pereira, E.I., de Oliveira, C.R. and Ramesh, K. 2016. Enhancing Nutrient Use Efficiency Using Zeolites Minerals—A Review. Advances in Chemical Engineering and Science. 6: 295-304.

Leggo, P.J. 2014. The organo-zeolitic soil system: A comprehensive fertilizer. Short communication. Int. J. Waste Resources, 4(3).

Leggo, P.J. 2014. The efficacy of the organo-zeolitic bio-fertilizer. Agrotechnol. 4(1).

Leggo, P.J., Ledesert, B., and Christie, G. 2006. The role of clinoptilolite in organo-zeolitic-soil systems used for phytoremediation. Science of the Total Environment. 363:1-10.

Omar, L., Ahmed, O.H., Majid, N.M. 2015. Improving Ammonium and Nitrate Release from Urea Using Clinoptilolite Zeolite and Compost Produced from Agricultural Wastes. Scientific World Journal.

Press Release. 2017. Zeolite-cannabis concludes, finding energized soils enhance cannabis production. Ashburton Ventures Inc. September 2017. Retrieved from <https://www.fscwire.com/newsrelease/zeolite-cannabis-study-concludes-finding-energized-soils-enhance-cannabis-production>, January 25, 2018

Industrial Specialties News. July 24, 2017. Edward Bielert comment on cannabis production cost reduction. BlendonISN, Victoria BC, Canada. Vol. 31(14)

Additional Information on file at Bear River Zeolite Co.