20 MULE TEAM®

Solubor®

Soluble borate powder for crop nutrient sprays and solutions

Product Profile

20.9% B Typical
$Na_2B_8O_{13}·4H_2O$
Disodium Octaborate Tetrahydrate

BORAX®

Background

Boron is one of seven micronutrients essential to all plant growth. Its role was recognised first in the 1920s and since that time, boron deficiency has been recognised in a wide range of crops.

Correcting boron deficiency

Boron deficiency can be remedied by the correct application of a borate containing material in solid or liquid fertilisers, to the seedbed in annual crops or under the foliar canopy of perennial crops. Perennial and annual crops can also be sprayed with boron containing solutions. These are normally tank mixed with other micronutrients or with agrochemical products.

The latter method of application may be preferable since at peak requirement times the boron needs of the growing plant can frequently exceed its ability to obtain its needs through the roots. Mixing with other sprays as part of a programme enables the grower to time this availability and save application cost.

Detecting boron deficiency

Boron deficiency shows in clearly defined ways in certain crops. Generally, by the time visible symptoms are seen, yields will already have been adversely affected. The best way to establish need is either through soil testing or through tissue analysis. In this way, boron supplementation can form part of a 'balanced nutrition' approach to crop fertilisation.

Predicting boron deficiency

Certain crops world-wide are known to be more susceptible to lack of boron than others. These are shown in the tables.

Susceptible

Alfalfa (Lucerne)	Coffee	Olive
Apple	Cotton	Pine
Broccoli	Eucalyptus	Red beet
Carnation	Grape	Rutabaga
Cauliflower	Groundnut	Sugar beet
Carrot	Mangold	Sunflower
Celery	Oil palm	Swede
Chrysanthemum	Oilseed rape	Turnip

Moderately susceptible

Banana	Cocoa	Pear
Brussels sprout	Coconut	Poppy
Cabbage	Flax Linseed	Potato
Chinese cabbage	Hop	Tea
Citrus	Maize Corn	Tobacco
Clover	Papaya	Tomato

There are several factors which need to be taken into account when boron deficiency may be suspected:

- High rainfall
- Recent liming (pH over 6.6)
- Previous cropping
- Boron removal by previous crops
- No boron nutrition
- Sandy soils
- High organic matter

Additional reading

Boron Deficiency—Its Prevention and Cure,
by V.M. Shorrocks (available from Borax on request.)

Mineral Nutrition of Higher Plants,
by Horst Marschner, Academic Press.

Boron and its Role in Crop Production,
by Umesh C. Gupta. CRC Press.

Solubor is manufactured to combine the highest concentration of boron with the maximum possible dispersion and solubility in water. As such, it has a number of different uses in agro-industrial markets, in addition to its long established role in farm sprays.

To calculate the amount of *Solubor* required multiply the elemental boron required by 4.8.

Main uses

- Coating of finished solid fertilisers.
- Manufacture of solution or suspension fertilisers. Optimised dissolution at low ambient temperatures and high concentration make *Solubor* the product of choice.
- Formulation of high performance liquids containing either boron alone or a combination of nutrients for spraying, 'fertigation' or irrigation.
- Inclusion in multi-element soluble powder formulations for spraying on farm.
- To provide boron through irrigation, fertigation or hydroponics where this is the most practical form of plant feeding.

Advantages

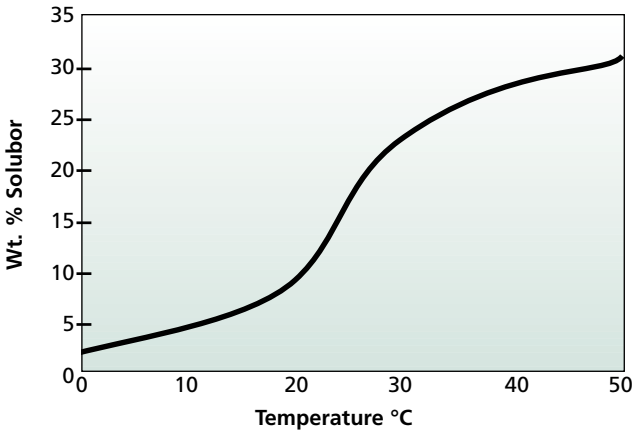
Rapid dispersion

The amorphous particles of *Solubor* facilitate rapid wetting and incorporation in water and more viscous liquids, even at low temperatures.

High solubility

The minute particle size of *Solubor* (<75 microns) and inherent high solubility, even at low temperatures, gives rapid solubility properties even under demanding conditions.

Solubility in water



Temperature °C	Temperature °F	Weight % of Solubor in saturated solutions	Percent concentration of boron (B) in saturated solutions
0	32	2.4	0.5
10	50	4.5	0.9
20	68	9.5	2.0
30	86	21.9	4.4
40	104	27.8	5.7
50	122	32.0	6.5

Note: Solubilities in the above table are for equilibrium conditions. *Solubor* readily dissolves even in cool water to give supersaturated solutions of considerably higher concentration than indicated in the graph.

Minimal crystallisation effect

Solubor causes minimum changes to crystallisation temperatures or density of formulations. Experience has shown that levels of up to 2.7% *Solubor* can be added to the more common liquid fertiliser formulations while maintaining crystallisation temperatures below 1.7°C (35°F).

pH buffering action

Solubor has a slight buffering action and maintains pH in solutions.

Percent Solubor by weight of solution	pH at 23°C (73.4°F)
1	8.5
2	8.4
5	8.0
10	7.6
15	7.3

Bulk density

Pack type	kgm^{-3}	lb/cu. ft.
Loose pack	400	25
Tight pack	560	35

High boron content (20.9% typical)

The relatively small quantities of *Solubor* needed to correct deficiency (and therefore for addition to formulations) make it an economical source of boron for manufacturers.

Notice:

Before using these products, please read the Product Specifications, the Safety Data Sheets and any other applicable product literature.

The descriptions of potential uses for these products are provided only by way of example. The products are not intended or recommended for any unlawful or prohibited use including, without limitation, any use that would constitute infringement of any applicable patents. Nor is it intended or recommended that the products be used for any described purposes without verification by the user of the products' safety and efficacy for such purposes, as well as ensuring compliance with all applicable laws, regulations and registration requirements. Suggestions for use of these products are based on data believed to be reliable. The seller shall have no liability resulting from misuse of the products and provides no guarantee, whether expressed or implied, as to the results obtained if the products are not used in accordance with directions or safe practices. The buyer assumes all responsibility, including any injury or damage, resulting from misuse of the product, whether used alone or in combination with other materials. THE SELLER MAKES NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE SELLER SHALL HAVE NO LIABILITY FOR CONSEQUENTIAL DAMAGES.

Borax Asia Pte. Ltd.
501 Orchard Road
#08-02 Wheelock Place
Singapore 238880
Tel: (65) 738 6068
Fax: (65) 738 6282

Borax Europe Limited
1A The Guildford Business Park
Guildford, GU2 8XG
United Kingdom
Tel: (44) 1483 242000
Fax: (44) 1483 242001

U.S. Borax Inc.
26877 Tourney Road
Valencia, California, 91355-1847
United States
Tel: (1) 661 287 5400
Fax: (1) 661 287 5495

A member of the Rio Tinto Group

www.borax.com