







#### **INGREDIENTS:**

Active Ingredient:

Pyridate: O-(6-chloro-3-phenyl-4-pyridazinyl)-

### A RELIABLE SOLUTION TO A "GROWING" PROBLEM...

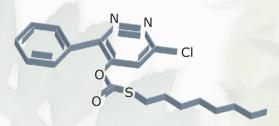
Industry experts have determined that the typical yield loss caused by weeds in chickpeas can be well over the 20% minimum defined by the EPA as Significant Economic Loss (SEL). Weeds also negatively impact seed quality, and pose difficulties during harvest time. Slow growth of the chickpea plant during its seedling stages, in addition to its more open canopy and low growth design, reduces its ability to compete with weeds. Moreover, the lack of weed management options facilitates weed seed production and contributes to the loading of the soil seed bank.

Common lambsquarters, Mayweed chamomile, Nightshade species, Russian thistle and Kochia as well as other broadleaf weeds, can be problematic in chickpeas, reducing yield, impacting seed quality and interfering with harvest. For example, if left untreated, Common lambsquarters has the potential to produce up to 500,000 seeds per plant. Seeds can remain in the soil for years and can negatively affect future crops, including future chickpea production. While Mayweed chamomile plants produce fewer (5,000 to 17,000) seeds, viability greater than 50% has been reported after more than 11 years in the soil (Van Vleet 2006).

In response to the growing issue of weed management, Belchim Crop Protection USA brings TOUGH® 5EC to chickpea growers in the United States. The active ingredient in TOUGH® 5EC is pyridate, an underutilized chemistry in the United States. Chickpea growers now have a registered herbicide available that can be applied post-emergence that will provide control of broadleaf weeds such as Common Lambsquarters, Mayweed chamomile, Kochia, and Russian thistle.

#### **PYRIDATE**

- Targets unique pathway within the PSII group of herbicides (Groups 5, 6 & 7)
- WSSA Classification: Group 6
- No known cross-resistance to other PSII's



# **WEEDS CONTROLLED**



Common Waterhemp



Mayweed chamomile



Kochia



Common Lambsquarters



Black Nightshade



Pigweeds



Palmer Amaranth

# TOUGH® 5EC PHOTOSYNTHESIS II INHIBITOR

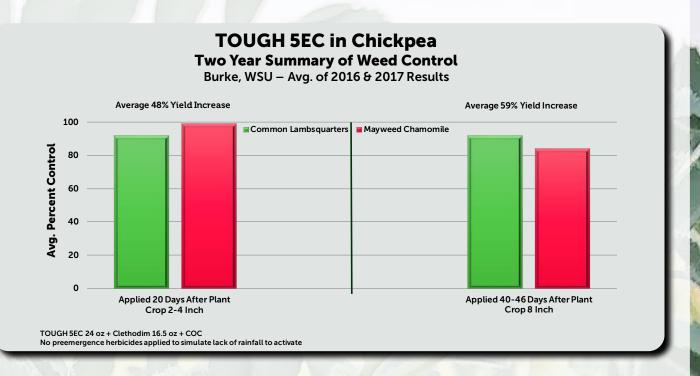
Pyridate works by blocking a weed's photosystem II process, triggering the release of toxic forms of oxygen and causing rapid cell wall degradation. Pyridate is a highly effective mode of action in corn and shows increased levels of weed control in tank-mix combinations.

- Pyridate is applied after emergence of the weed.
- Pyridate is quickly absorbed by the leaves (rain-fast within 60 minutes).
- Pyridate blocks photosystem II of the weed by irreversibly binding to the D1 protein and inhibiting the transport of electrons. High energy electrons then interact with oxygen, producing toxic forms of oxygen.
- The toxic forms of oxygen interact and degrade the cell's membranes resulting in necrosis (browning) and ultimate death to the weed.

### PROVEN PERFORMANCE

Several years ago, as post emergent broadleaf weed control options did not exist for chickpea growers, there was an unfilled need in the industry. To help solve this critical need for growers; Dr. Ian Burke and his team at Washington State University began evaluating non-registered products. One (at that time) of which is TOUGH® 5EC.

Below, is a summary of results from the 2016 & 2017 research trials that demonstrate that TOUGH® 5EC is a viable product for common lambsquarters & mayweed chamomile control at levels that result in increased yields. Trials were conducted without a pre-emergence herbicide application to simulate lack of moisture for activation. The average of two year studies when TOUGH® 5EC 24oz + clethodim 16.5oz + COC was applied at 20 days after planting (DAP) resulted in a 48% yield increase. When applied at 40-46 DAP, average yield increase of 59% was documented.





# A Great Tool for "Tough" to Control Weeds

- A SELECTIVE HERBICIDE For Post-Emergence Control Or Suppression Of Annual Broadleaf Weeds
- GROUP 6 PROVEN AND EFFECTIVE Mode of Action
- Contact herbicide -> NO ROTATIONAL Issues
- PROPRIETARY Active Ingredient: Pyridate
- Formulated as a 5 lb ai/gal EMULSIFIED CONCENTRATE
- RAINFAST Within 1 Hour
- NO RESIDUAL Restrictions



Belchim Crop Protection is an agrochemical/biological company with a strong commitment to research and development, working to empower farmers through innovative crop protection products and high-end technical support. Founded in Belgium in 1987, it is a globally expanding company. Under the leadership of its founder, Dirk Putteman, Belchim grew into an established name in the crop protection industry over the last 30 years.

One of our core values is to "provide solutions to growers," and our research and development efforts reflect the growing desire for sustainable solutions that will stand the test of time in an increasingly restrictive regulatory environment. We are committed to take a product from research through regulatory approval, and finally to the growers through our distributor partners.

With a focus on development, registration and commercialization, Belchim is the preferred marketing partner for several R&D companies. In line with market needs Belchim offers unique agrochemical solutions for today and tomorrow.

Today we are operating in more than 55 countries (the USA Headquarters in Wilmington, Delaware). To learn more about Belchim, please visit www.belchim.com.