Options Address CIPC Limits For Sprout Control

Effective option offers secondary control

BY JAN W. DE WEERD, PH.D

Several years ago, when reregistering the sprout inhibitor CIPC (Chlorpropham), the US Environmental Protection Agency (EPA) took steps to control the amount of CIPC that is used on a yearly basis. Maximum limits were designed for the amount of CIPC that can be applied to potatoes. The formula for determining the maximum application considers both storage time and temperature variables (Table 1).

RETREATING IMPACT

The most important aspect of these rates is how they impact re-treatment of stored potatoes. The label is very specific on the limits of re-treatment. It reads: "…. using either the above chart or the rate formula, the re-treatment application must be no greater than the total amount required for the extended storage time minus the amount already applied."

Study illustrating effectiveness of 1,4SIGHT (1,4DMN) on potatoes previously treated with CIPC versus CIPC alone.

Re-treating at the full rate is not allowed. The maximum amount of CIPC that can be applied is limited. For instance, if one anticipates a 10-month storage at a temperature of 45˚F, the maximum amount that can be applied is 135% of standard label, which equates to 1lb. of CIPC per 444 cwt. (22.2 tons) of potatoes. If a storage manager wants to come back with a second treatment of CIPC after applying 120%, or 1lb. for 500 cwt. (25 tons) in the first treatment, they could apply only another 15%. These low rates as a second treatment are generally not sufficient to stop sprouting and can result into internal sprouting.

EFFECTIVE OPTION

1,4-Dimethylnaphthalene (1,4-DMN), a naturally occurring compound in potatoes, was discovered in the early seventies by scientists in the United Kingdom then introduced to the US market in 1996. 1,4-DMN acts as a temporary dormancy enhancer, not as an herbicide. As a follow up to potatoes that have been previously treated with CIPC, it is very effective in permanently stopping sprouts (see Figure 2: Study illustrating effectiveness of 1,4SIGHT® (1,4-DMN) on potatoes previously treated with CIPC versus CIPC alone). Through its dormancy

Table One
Maximum CIPC Application Rates

TIME	STORAGE TEMPERATURE				
MONTHS	**40°F**	**45°F**	**50°F**	**55°F/1**	**60°F/1**
1	80%	90%	100%	110%	120%
2	85%	95%	105%	115%	125%
3	90%	100%	110%	120%	130%
4	95%	105%	115%	125%	135%
5	100%	110%	120%	130%	140%
6	105%	115%	125%	135%	145%
7	110%	120%	130%	140%	150%
8	115%	125%	135%	145%	155%
9	120%	130%	140%	150%	160%
10	125%	135%	145%	155%	165%

/1 - Rates for 55˚F and 60˚F are for processing potatoes only.

The chart is based on the following formula:
% of Standard Application Rate = (2 X T) + [(5 X M)-5]
Where: Standard Application Rate = 1 pound active ingredient/600 cwt. (30 tons)
T = Storage Temperature
M = Number of Months Storage Time
For instance, potatoes stored at 45˚F for six months can be treated with up to 115% of the standard rate:
(2 X 45) + [(5 X 6) - 5] = 115% of standard rate.

Table Two Sprout suppression by naphthalene based compounds		
Compound	Sprout Weight (% of control)	Sprout Weight (% of control)
Untreated	100%	100%
Naphthalene	24%	20%
2-Methylnaphthalene	2%	8%
1,4-Dimethylnaphthalene	0%	0%
2,6-Dimethylnaphthalene	70%	64%
Reconstructed from Meigh et al., Phytochemistry. Volume 12: 987-993.		

enhancing action, it is also effective in delaying the onset of sprouts, often referred to as "peeps". It can be applied more than once if necessary and potatoes can be shipped immediately after treatment. Because its efficacy is independent of CIPC use, it can be used separately on an as-needed basis as well.

1,4-Dimethylnaphthalene (1,4-DMN) has proven to be a powerful option for controlling sprouting. Among the naphthalene based compounds, this is one of the most potent sprout suppressants available (Table 2).

FRY COLOR

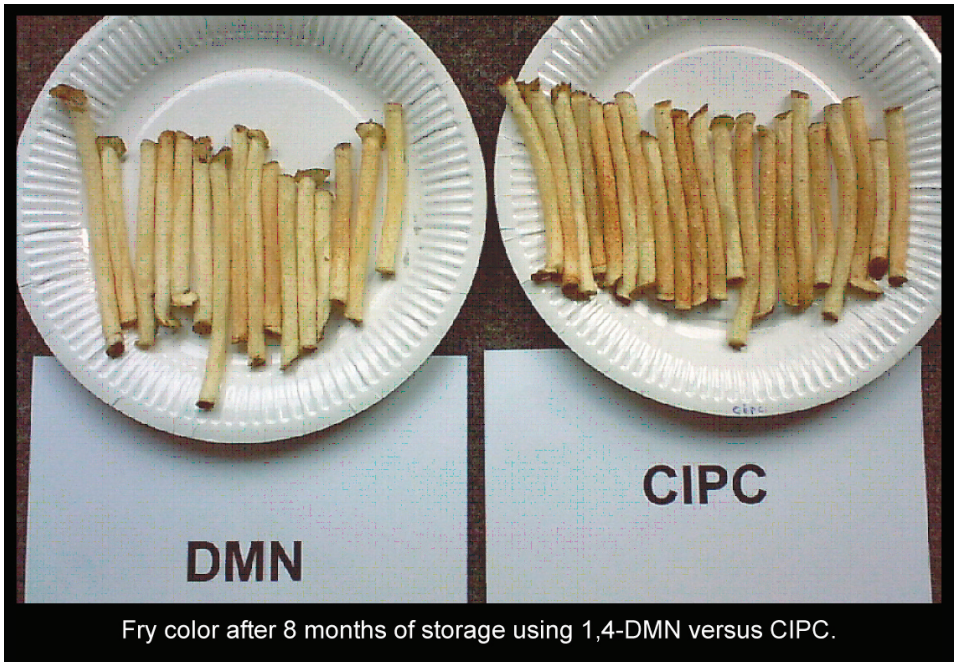
Although improvements of CIPC formulation and application methods have significantly reduced the potential for spiking fry colors and sugars, a level of concern always exists. Extensive storage studies in Europe using 1,4-DMN instead of CIPC have shown a strong tendency to produce lighter fry colors (Figure 3). The option of using 1,4-DMN for re-treatment to stop sprouting is of particular importance for sugar sensitive varieties such as Ranger Russet, Umatilla and several chipping varieties.

OTHER OPTIONS

A number of options are available or coming to market to supplement a CIPC program.

1) **1,4SIGHT®.** 1,4-DMN is the active ingredient in 1,4SIGHT®, which is marketed by the One Four Group in Meridian, ID. It is classified as a bio-chemical compound and has a non-toxic mode of action. It can be used to supplement a CICP based program or used independently to effectively control sprouts. Potatoes can be shipped immediately after treatment.

2) **Amplify®**. Platte Chemical, Greeley, CO. The active ingredient in this formulation is 2,6-Diisopropylnaphthalene, which is also classified as a biochemical pesticide with a non-toxic mode of action. The label recommends using this product in combination with CIPC. Use only as a stand-alone if some sprouting is acceptable. The label restricts the use to one time per season and potatoes can not be shipped for 30 days after application.



Fry color after 8 months of storage using 1,4-DMN versus CIPC.

Figure 3. Fry color after eight months of storage using 1,4DMN versus CIPC.

3) **Biox C.** Pace International, Seattle, WA. The active ingredient in this formulation is clove oil. Clove oil is very effective in "burning" sprouts once they have appeared. For prolonged storage, retreats may be necessary as new sprouts will continue to appear. The label also allows for treatment against Silver Scurf. Currently, there is no restriction on the number of treatments or when potatoes can be shipped after treatment.

4) **Sprout Torch™**. D-I-1-4, Inc., Meridian, ID. This new clove oil based sprout control is under development. It is designed to remove existing peeps and sprouts. Availability is expected in 2005.

(EDITOR'S NOTE:

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