



IRMM Certified GMO Standards

New GMO Maize Standards (GA21 and NK603)

Reliable, certified standards are required for proper identification and quantification in food and feedstuff. Sigma-Aldrich, through its Fluka brand, is now presenting new standards for GMO Maize GA21 and NK603, made of dried flour containing different mass fractions of GMO derived material.

- Maize GA21 **NEW!**
- Maize NK603 **NEW!**
- Maize Bt-176 Maximizer®
- Maize Bt-11
- Maize MON 810 YieldGard®
- Soya Roundup Ready®

Genetically Modified Organisms (GMOs)

To feed a burgeoning world population and concomitantly increase profits, commercial agriculture continues to explore the potential benefits of using genetically modified organisms (GMOs). These benefits include increased crop yields, resistance to disease and pests, enhanced nutritional value, longer growing seasons and decreased loss during shipping and storage, among others. GMOs are also under study as a means to produce pharmaceutical compounds more economically than classic synthetic means. However, pressure from commercial agricultural to expand the use of GMOs must be balanced against consumers' understandable wariness of GMOs and potential impact on adjacent organisms. The debate will no doubt continue into the foreseeable future, and analytical chemistry will play a critical role.

GMOs and Analytical Chemistry

In April 2004 new legislation was introduced in Europe regarding the labeling of genetically modified foods and feedstuffs. This new legislation requires that even highly modified foods such as lecithin, starch and oil, as well as feedstuffs containing GMOs, are labeled clearly as such. The labeling requirements as well as the need to monitor levels of GMO spread into adjacent commercial crops and native species and in the tissues of animals that are raised on GMO feedstuff required analytical methods that can determine the content of GMO material in a sample. As with any analytical method, certified standards are required

for reliable identification and quantification. The arm of the European Union responsible for developing and producing these standards is the Institute for Reference Materials and Measurements (IRMM). According to their website (www.irmm.jrc.be), the mission of the IRMM is to "promote a common European measurement system in support of EU policies." The IRMM provides IRMM, BCR® and ERM® certified reference materials, for which Sigma-Aldrich is an authorized distributor.

IRMM Certified Standards for Roundup Ready® Soya Bean (ERM-BF410)

Developed by Monsanto, Roundup Ready® Soya Bean was introduced to allow no-till farming by application of their broad-spectrum herbicide, Roundup® (glyphosate), to kill weeds throughout the growing season.

Sigma-Aldrich offers six certified reference materials (CRM) produced by the IRMM along with a convenient calibration set. They comprise non-GMO dried Soya Bean powder containing 0, 0.1, 0.5, 1, 2 and 5% by weight of GMO Roundup Ready® Soya Bean. The non-GMO raw material is from whole seeds of a non-modified Soya Bean line (Asgrow® line A1900). It contains less than 0.03% w/w Roundup Ready® Soya Bean GMO. The GMO Soya Bean used in these CRMs is genetically modified Round-up Ready® Soya Bean (Asgrow® line AG5602 RR). Both are from Monsanto. Homogeneity is assured by the use of a dry-mixing technique, which also minimizes DNA and protein degradation during production. The Roundup Ready® Soya CRMs are provided in glass bottles containing 1 g of dried Soya Bean powder packed under argon atmosphere.

Table 1 Roundup Ready™ Soya Bean Certified Standards (ERM-BF410)

Cat. No.	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO Mass Fraction	Quantity
94162	Soya Bean Powder Set	ERM-BF410	0% (<0.03%), 0.1%, 0.5%, 1%, 2% and 5% GMO RR® Soya Bean		1 set (1 gram each)
83063	Soya Bean Powder	ERM-BF410a	0% (<0.03%) GMO RR® Soya Bean	< 0.3 g GMO/kg	1 gram
72647	Soya Bean Powder SB 0.1	ERM-BF410b	0.1% GMO RR® Soya Bean	1.0 g GMO/kg	1 gram
81751	Soya Bean Powder SB 0.5	ERM-BF410c	0.5% GMO RR® Soya Bean	5.0 g GMO/kg	1 gram
76913	Soya Bean Powder SB 1	ERM-BF410d	1% GMO RR® Soya Bean	10.0 g GMO/kg	1 gram
78767	Soya Bean Powder SB 2	ERM-BF410e	2% GMO RR® Soya Bean	20.0 g GMO/kg	1 gram
93109	Soya Bean Powder SB 5	ERM-BF410f	5% GMO RR® Soya Bean	50.0 g GMO/kg	1 gram

* The diluent powder and the 0% standard are nominally <0.03% w/w GMO RR® Soya Bean

Ordering Information

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Picture Maize

IRMM Certified Standards for Maize Bt-11, Maize Bt-176, Maize MON 810, Maize GA21 and Maize NK603 (ERM-BF411, 412 and 413, and ERM-BF414 and 415)

Maize (corn) is one of the world's most widely produced crops. It is used as animal feedstuff, and is a raw material for the manufacture of starch and ultimately sweeteners, syrups and fermentation products, including ethanol. Maize oil is extracted from the germ of the corn kernel. One of the agricultural challenges to Maize production is crop damage from insects, most notably the corn borer. Maize Bt-11, Bt-176 (both from Syngenta), and Maize MON 810 (from Monsanto) have been genetically modified to contain the Cry1Ab gene from *Bacillus thuringiensis*. Insertion of this bacterial gene gives the plant the ability to produce Bt protein, an insecticide with particular toxicity to corn borers. In 2004, the EU has approved the Roundup Ready Maize NK603 (glyphosate-tolerant)

from Monsanto. The authorization for the glyphosate-tolerant Maize GA21, also by Monsanto, is still pending.

Sigma-Aldrich offers six certified reference materials (CRM) produced by the IRMM, along with a convenient calibration set for each Maize variety. The standards comprise non-GMO dried Maize powder containing 0, 0.1, 0.5, 1, 2 and 5% by weight of the three different GMO Maize varieties. The non-GMO raw material is from whole kernels of a non-modified Maize line. Content of GMO Maize contained in the diluent (and the 0% standard) appears in the tables below. Homogeneity is assured by the use of a dry-mixing technique, which also minimizes DNA and protein degradation during production. The GMO Maize CRMs are provided in glass bottles containing 1 g of dried Maize powder packed under argon atmosphere.

EMR® is a registered trademark of the European Commission. Maximizer®, YieldGard® and Roundup Ready® are registered trademarks of Monsanto.

Table 2 Maize Bt-176 Certified Standards (ERM-BF411)

Cat. No.	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO Mass Fraction	Quantity
03828	GMO Maize Bt-176 Powder Set	ERM-BF411	0%, 0.1%, 0.5%, 1%, 2% and 5% GMO Maize Bt-176		1 set (1 gram each)
91528	GMO Maize Bt-176	ERM-BF411a	0% (<0.014%) GMO Maize Bt-176	< 0.14 g GMO/kg	1 gram
91516	GMO Maize Bt-176	ERM-BF411b	0.1% GMO Maize Bt-176	1.0 g GMO/kg	1 gram
14724	GMO Maize Bt-176	ERM-BF411c	0.5% GMO Maize Bt-176	5.0 g GMO/kg	1 gram
95772	GMO Maize Bt-176	ERM-BF411d	1% GMO Maize Bt-176	10.0 g GMO/kg	1 gram
89092	GMO Maize Bt-176	ERM-BF411e	2% GMO Maize Bt-176	20.0 g GMO/kg	1 gram
19074	GMO Maize Bt-176	ERM-BF411f	5% GMO Maize Bt-176	50.0 g GMO/kg	1 gram

* The diluent powder and the 0% standard are <0.014% w/w GMO Maize Bt-176

Table 3 Maize Bt-11 Certified Standards (ERM-BF412)

Cat. No.	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO Mass Fraction	Quantity
03831	GMO Maize Bt-11 Powder Set	ERM-BF412	0%, 0.1%, 0.5%, 1%, 2% and 5% GMO Maize Bt-11		1 set (1 gram each)
91524	GMO Maize Bt-11	ERM-BF412a	0% (<0.02%) GMO Maize Bt-11	< 0.12 g GMO/kg	1 gram
54703	GMO Maize Bt-11	ERM-BF412b	0.098% GMO Maize Bt-11	0.98 g GMO/kg	1 gram
52492	GMO Maize Bt-11	ERM-BF412c	0.49% GMO Maize Bt-11	4.9 g GMO/kg	1 gram
19577	GMO Maize Bt-11	ERM-BF412d	0.98% GMO Maize Bt-11	9.8 g GMO/kg	1 gram
19558	GMO Maize Bt-11	ERM-BF412e	1.96% GMO Maize Bt-11	19.6 g GMO/kg	1 gram
65944	GMO Maize Bt-11	ERM-BF412f	4.89% GMO Maize Bt-11	48.9 g GMO/kg	1 gram








* The diluent powder and the 0% standard are <0.012% w/w GMO Maize Bt-11

Table 4 Maize MON 810 Certified Standards (ERM-BF413)

Cat. No.	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO Mass Fraction	Quantity
78761	GMO Maize MON 810 Powder Set	ERM-BF413	0%, 0.1%, 0.5%, 1%, 2% and 5% GMO Maize MON 810		1 set (1 gram each)
77119	GMO Maize MON 810	ERM-BF413a	0% (<0.02%) GMO Maize MON 810	< 0.2 g GMO/kg	1 gram
74411	GMO Maize MON 810	ERM-BF413b	0.1% GMO Maize MON 810	1.0 g GMO/kg	1 gram
79521	GMO Maize MON 810	ERM-BF413c	0.5% GMO Maize MON 810	5.0 g GMO/kg	1 gram
71981	GMO Maize MON 810	ERM-BF413d	1% GMO Maize MON 810	10.0 g GMO/kg	1 gram
79112	GMO Maize MON 810	ERM-BF413e	2% GMO Maize MON 810	20.0 g GMO/kg	1 gram
76182	GMO Maize MON 810	ERM-BF413f	5% GMO Maize MON 810	50.0 g GMO/kg	1 gram








* The diluent powder and the 0% standard are <0.02% w/w GMO Maize MON 810

Table 5 GMO Maize GA21 Certified Standards (ERM-BF414)

Cat. No.	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO Mass Fraction	Quantity
06683	 Maize GA21 Powder Set	ERM-BF414	0%, 0.1%, 0.5%, 1%, 1.7%, 4.3% GMO Maize GA21		1 set (1 gram each)
68362	 Maize GA21	ERM-BF414a	0% (<0.08%) GMO Maize GA21	0.8 g GMO/kg	1 gram
48931	 Maize GA21	ERM-BF414b	0.1% GMO Maize GA21	1.0 g GMO/kg	1 gram
49316	 Maize GA21	ERM-BF414c	0.49% GMO Maize GA21	4.9 g GMO/kg	1 gram
63485	 Maize GA21	ERM-BF414d	0.99% GMO Maize GA21	9.9 g GMO/kg	1 gram
11772	 Maize GA21	ERM-BF414e	1.72% GMO Maize GA21	17.2 g GMO/kg	1 gram
43214	 Maize GA21	ERM-BF414f	4.29% GMO Maize GA21	42.9 g GMO/kg	1 gram

* The diluent powder and the 0% standard are <0.08% w/w GMO Maize GA21

Table 6 GMO Maize NK603 Certified Standards (ERM-BF415)

Cat. No.	Cert. Ref. Material	IRMM Ref. No. (ERM® Brand)	% w/w GMO*	Certified GMO Mass Fraction	Quantity
06943	 Maize NK603 Powder Set	ERM-BF415	0%, 0.1%, 0.5%, 1%, 2%, 5% GMO Maize NK603		1 set (1 gram each)
63486	 Maize NK603	ERM-BF415a	0% (<0.04%) GMO Maize NK603	0.4 g GMO/kg	1 gram
44826	 Maize NK603	ERM-BF415b	0.1% GMO Maize NK603	1.0 g GMO/kg	1 gram
49827	 Maize NK603	ERM-BF415c	0.49% GMO Maize NK603	4.9 g GMO/kg	1 gram
67156	 Maize NK603	ERM-BF415d	0.98% GMO Maize NK603	9.8 g GMO/kg	1 gram
61782	 Maize NK603	ERM-BF415e	1.96% GMO Maize NK603	19.6 g GMO/kg	1 gram
53226	 Maize NK603	ERM-BF415f	4.91% GMO Maize NK603	49.1 g GMO/kg	1 gram

* The diluent powder and the 0% standard are <0.04% w/w GMO Maize NK603



Picture Soya Bean

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