



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Office for Agriculture FOAG
Federal Office for the Environment FOEN

Swiss Federal Plant Protection Service SPPS



Risk based sampling of tomato seed: Tomato brown rugose fruit virus (ToBRFV)





Questions to be answered:

- Identify the consignment posing the highest risk and discuss risk factors (3 Scenarios!)
- Determination of the samples size according to ISPM 31, if you want to have a confidence level of 99 % to identify an infestation level of 0.1%.
- Use Scenario 3 to discuss sampling of small lots of seed.
- What do you have to consider when sampling tomato seeds or other seeds.



Scenarios:

Scenario 1:

Import of 90.5 kg seeds of *Solanum lycopersicum* seeds from the US. The consignment consists of 12 different lots (Nr. 43 – 54).

The exporter “Shiny Seed Co., LTD” in the US, is situated in an area known to be free of ToBRFV. The company so far has no history of intercepted consignments, due to the presence of ToBRFV.



Scenarios:

Scenario 2:

**Import of 68.3 kg seeds of *Solanum lycopersicum* seeds from China.
The consignment consists of 8 different lots (Nr. 120 – 127).**

The exporter “Dark Seed Co., LTD” in China, has already a history of several rejected consignment due to infestation of ToBRFV.



Scenarios:

Scenario 3:

Import of 0.5 kg seeds of *Solanum lycopersicum* seeds from the Breeding company “New Seeds for all” from Argentina.

The consignment consists of 100 new varieties of seeds of *Solanum lycopersicum* (Nr. A1 – A100). Each lot consists of 5 g seeds (about 300 seeds/g).



Scenario with highest risk?

Scenario 1:

Import of 90.5 kg seeds of *Solanum lycopersicum* seeds from the US. The consignment consists of 12 different lots (Nr. 43 – 54). The exporter “Shiny Seed Co., LTD” in the US, is situated in an area known to be free of ToBRFV. The company so far has no history of intercepted consignments, due to the presence of ToBRFV.

Scenario 2:

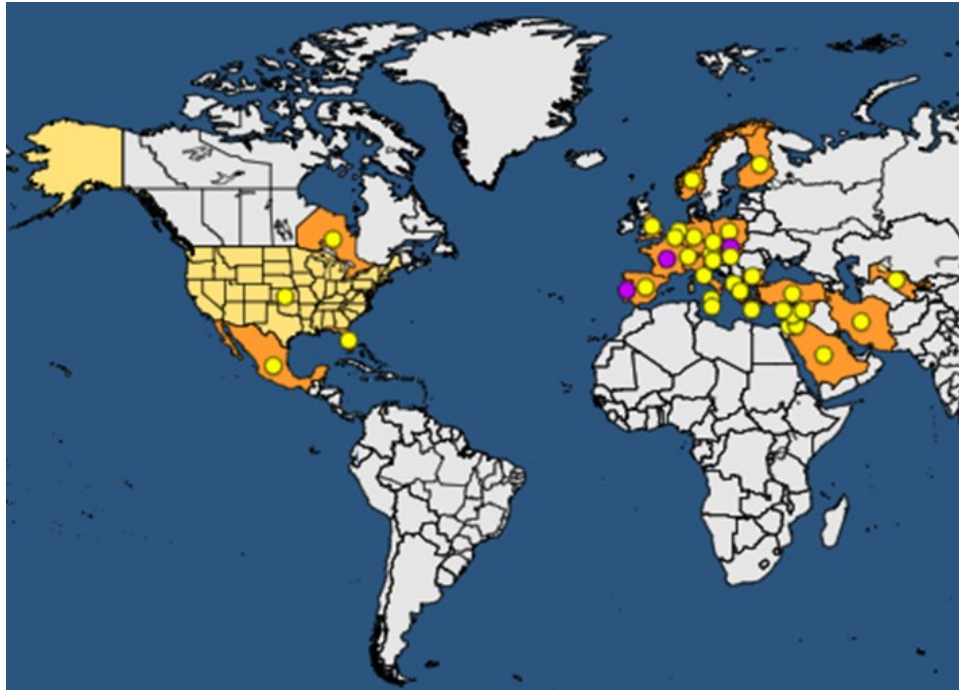
Import of 68.3 kg seeds of *Solanum lycopersicum* seeds from China. The consignment consists of 8 different lots (Nr. 120 – 127). The exporter “Dark Seed Co., LTD” in China, has already a history of several rejected consignment due to infestation of ToBRFV.

Scenario 3:

Import of 0.5 kg seeds of *Solanum lycopersicum* seeds from the Breeding company “New Seeds for all” from Argentina. The consignment consists of 100 new varieties of seeds of *Solanum lycopersicum* (Nr. A1 – A100). Each lot consists of 5 g seeds (about 300 seeds/g).



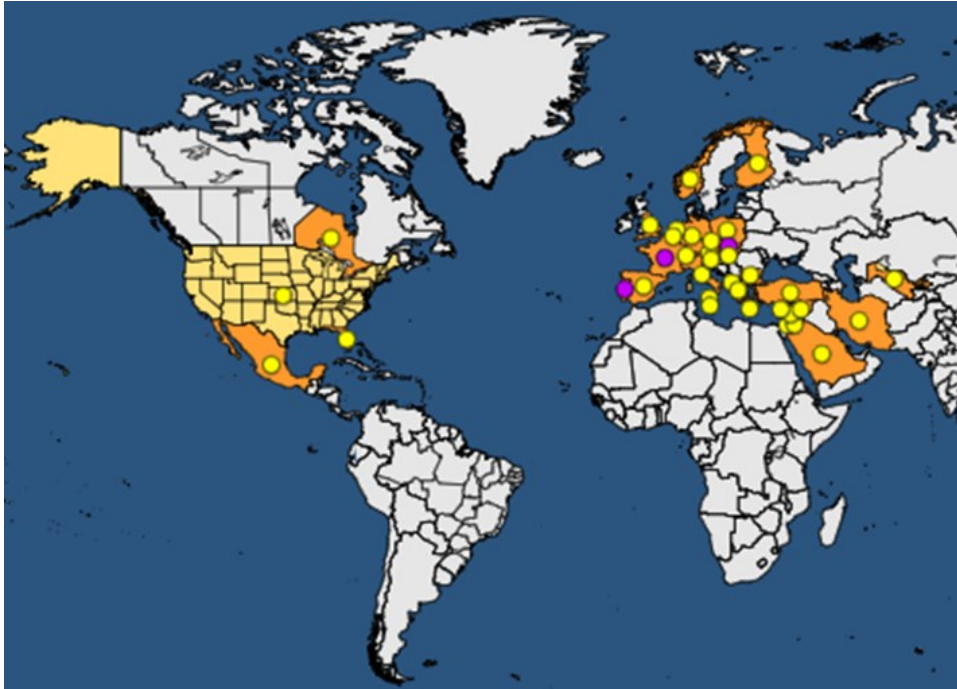
Distribution of ToBRFV



Africa	Egypt		Absent, invalid record	view...
Africa	Ethiopia		Absent, unreliable record	view...
America	Canada		Present, restricted distribution	view...
America	Canada	Ontario	Present, restricted distribution	view...
America	Chile		Absent, unreliable record	view...
America	Dominican Republic		Absent, unreliable record	view...
America	Guatemala		Absent, unreliable record	view...
America	Mexico		Present, restricted distribution	view...
America	Peru		Absent, unreliable record	view...
America	United States of America		Present, few occurrences	view...
America	United States of America	California	Absent, pest eradicated	view...
America	United States of America	Florida	Present, no details	view...
Asia	China		Present, few occurrences	view...
Asia	China	Shandong	Present, few occurrences	view...
Asia	China	Yunnan	Present, no details	view...
Asia	India		Absent, unreliable record	view...
Asia	Iran		Present, few occurrences	view...
Asia	Israel		Present, widespread	view...
Asia	Japan		Absent, unreliable record	view...
Asia	Jordan		Present, no details	view...
Asia	Lebanon		Present, no details	view...
Asia	Saudi Arabia		Present, no details	view...
Asia	Syria		Present, widespread	view...



Distribution of ToBRFV



Africa	Egypt		Absent, invalid record	view...
Africa	Ethiopia		Absent, unreliable record	view...
America	Canada		Present, restricted distribution	view...
America	Canada	Ontario	Present, restricted distribution	view...
America	Chile		Absent, unreliable record	view...
America	Dominican Republic		Absent, unreliable record	view...
America	Guatemala		Absent, unreliable record	view...
America	Mexico		Present, restricted distribution	view...
America	Peru		Absent, unreliable record	view...
America	United States of America		Present, few occurrences	view...
America	United States of America	California	Absent, pest eradicated	view...
America	United States of America	Florida	Present, no details	view...
Asia	China		Present, few occurrences	view...
Asia	China	Shandong	Present, few occurrences	view...
Asia	China	Yunnan	Present, no details	view...
Asia	India		Absent, unreliable record	view...
Asia	Iran		Present, few occurrences	view...
Asia	Israel		Present, widespread	view...
Asia	Japan		Absent, unreliable record	view...
Asia	Jordan		Present, no details	view...
Asia	Lebanon		Present, no details	view...
Asia	Saudi Arabia		Present, no details	view...
Asia	Syria		Present, widespread	view...

Reliability of the information?



Determination of sample size Scenario 2



Bright Seeds Co., Ltd

Tel: +86-937-285 9222

Fax: +86-937-285 9233

mail: info@brightseeds.com.cn

P.O. Box 109, Jiuquan735000, Gansu Province, P.R China

INVOICE

Invoice Nr. 20131010-001

Date: 10th October, 2013

CONSIGNEE: TRANS ZURICH LTD

5058 ZURICH AIRPORT- SWITZERLAND

FOR NEW TICIS SA GL - 6828 BALERN - SWITZERLAND

Attn: Mr REMO LUCCHINI

PURCHASER: EUGEN SEED srl

Address: Via Ghiacciaia,5

37052 CASALEONE(VR) ITALY

Tel: +39(0)442 320422 Fax: +39(0)442 320444

Contract Nr: EUG2013001

Shipping method: Airfreight

Destination: ZURICH, SWITZERLAND

Price per unit / kg: FCA Lanzhou, Gansu province PR. China

Terms of payment: Within 60 days after invoice date

Shipping mark	Description of goods	Lot No	BTS Code	Quantity (kgs)	Unit Price (EURO/kg)	Amount (EURO/kg)	Remark
EUG	Tomato seeds						
	<i>(Lycopersicon esculentum)</i>						
	CAMION	120	TM13143-01	5.0	500.0	2,500.0	
	CAMION	121	TM13144-01	8.9	250.0	2,225.0	
	CAMION	122	TM13145-01	9.8	750.0	7,350.0	
	CAMION	123	TM13146-01	2.5	750.0	1,875.0	
	CAMION	124	TM13147-01	15.8	750.0	11,850.0	
	CAMION	125	TM13148-01	8.4	250.0	2,100.0	
	CAMION	126	TM13149-01	5.8	350.0	2,030.0	
	CAMION	127	TM13150-01	12.1	250.0	3,025.0	
	Total:			68.3		32,955.0	

Amount: Thirty two thousand nine hundred fifty five EURO

中华人民共和国出入境检验检疫
ENTRY-EXIT INSPECTION AND QUARANTINE
OF THE PEOPLE'S REPUBLIC OF CHINA ORIGINAL
植物检疫证书
PHYTOSANITARY CERTIFICATE
编号 No.: GSHW01300308

发货人名称及地址
Name and Address of Consignor: BRIGHT SEEDS CO., LTD P.O. BOX 109,JIUQUAN 735000, GANSU PROVINCE, P.R. CHINA

收货人名称及地址
Name and Address of Consignee: EUGEN SEED SRL VIA GHIACCIAIA,5 37052 CASALEONE (VR) ITALY

品名
Name of Produce: TOMATO SEEDS Botanical Name of Plant: LYCOPERSICON ESCULENTUM

数量
Quantity Declared: **08.3**KG Mark & No.: BSG

包装种类及数量
Number and Type of Packages: CARTONS

产地
Place of Origin: GANSU, CHINA

目的地
Place of Destination: ZURICH, SWITZERLAND

运输方式
Means of Conveyance: BY AIR Date of Issuance: 4 NOV 2013

兹证明上述植物、植物产品或其他检疫物已按照植物检疫程序进行检验和/或检测, 被认为不带有害输入国家或地区规定的危险性有害生物, 并且符合本证书及其随附单据所列, 按照本证书/或随附单据进行植物检疫要求。
This is to certify that the plants, plant products or other regulated articles described above have been inspected and/or tested according to appropriate procedures and are considered to be free from quarantine pests specified by the importing country/ region, and practically free from other quarantine pests, and that they are considered to conform with the current phytosanitary requirements of the importing country/region.

熏蒸剂/灭天敌处理 DISINFESTATION AND/OR INSPECTION TREATMENT

日期 Date: 产地及数量 Origin and Quantity: 处理方法 Treatment: 熏蒸剂/灭天敌处理 Disinfestation and/or Inspection Treatment

附加声明 ADDITIONAL DECLARATION
SEE ATTACHMENT

检验检疫机构名称 Place of Issue: LANZHOU 签发日期 Date of Issue: 4 NOV 2013
Official Stamp: 检验检疫人 Authorized Officer: ZHANG LIYING 检验检疫 Signatures: [Signature]

证书
CERTIFICATE ORIGINAL
编号 No.: GSHW01300308

COMPLIANCE WITH ANNEX IV PART A, PART 1 OF EC PLANT HEALTH DIRECTIVE 2000/54/EC

SEEDS OF LYCOPERSICON ESCULENTUM (L.) KARSTEN EX FARW. HAVE BEEN OBTAINED BY MEANS OF AN APPROPRIATE ACID EXTRACTS OR AN EQUIVALENT METHOD APPROVED IN ACCORDANCE WITH THE PROVISIONS Laid DOWN IN ARTICLE 10

THE PLANTS HAVE BEEN OBSERVED AT THE PLACE OF PRODUCTION DURING THREE COMPLETE CYCLES OF VEGETATION. NO SYMPTOMS OF DISEASES CAUSED BY CLAVIBACTER MICHIGANENSIS SPP. MICHIGANENSIS (SMITH) DAVIS ET AL., XANTHOMONAS CAMPESTRIS PV. VESICATORIA (GRANDJE) DYER, POTTUS MONACI VIGIL, HAVE BEEN OBSERVED

PANICLE PLANTS WERE INSPECTED DURING ACTIVE GROWTH AND PLANTS FREE FROM POTATO SPINBLETTEN TUBER VIROID

- Seed weight to be used: 300 seeds/g
- Efficacy of the method: 100%



Determination of sample size Scenario 2

	weight(g)	seed/g	Total seeds
Lot 120	5000	300	1500000
Lot 121	8900	300	2670000
Lot 122	9800	300	2940000
Lot 123	2500	300	750000
Lot 124	15800	300	4740000
Lot 125	8400	300	2520000
Lot 126	5800	300	1740000
Lot 127	12100	300	3630000

中华人民共和国出入境检验检疫
ENTRY-EXIT INSPECTION AND QUARANTINE
OF THE PEOPLE'S REPUBLIC OF CHINA
植物检疫证书
PHYTOSANITARY CERTIFICATE
原单 No. 5204012020048

发货人名称及地址
Name and Address of Consignor: BEIJING HEEB INC. VIA QIANGTAI'S STORE CABARET/CHINA
收货人名称及地址
Name and Address of Consignee: LYCOPERICON EMERLINDUM
品名
Name of Produce: TOMATO SEEDS Botanical Name of Plant: LYCOPERICON ESCULENTUM
原产数量
Quantity Declared: **08.1**KG Mark & No.: 810
包装种类及数量
Number and Type of Packages: CARTONS
产地
Place of Origin: GAMBELG/CHINA
目的地/口岸
Port of Destination: ZURICH, SWITZERLAND
运输工具
Means of Conveyance: BY AIR 检验检疫日期
Date of Inspection: 4 MAY 2013

兹证明上述植物、植物产品或其他检疫物已按照规定程序进行检验和/或检测，被认为不带有害输入国或输出国关注的检疫性有害生物，并且符合本规定及其他检疫要求。因此准予签发此证书放行供植物检疫使用。
This is to certify that the plants, plant products or other regulated articles described above have been inspected and/or tested according to appropriate procedures and are considered to be free from quarantine pests specified by the importing country/ region, and practically free from other injurious pests, and that they are considered to conform with the current phytosanitary requirements of the importing country/region.

表列明/或天通过其他 DISINFESTATION AND/OR INSPECTION TREATMENT
日期
Date: ** ** 药剂及浓度
Chemical and Concentration: ** **
处理方法
Treatment: ** ** 处理环境温度
Quarantine and Temperature: ** **

附加声明 ADDITIONAL DECLARATION
NO ADDITIONAL
** ** **

检验检疫地点
Place of Issue: LANZHOU 签发日期
Date of Issue: 4 MAY 2013
检验检疫人
Authorized Officer: ZHANG LIPING 签名
Signature: [Signature]

中华人民共和国国家质量监督检验检疫总局
GENERAL ADMINISTRATIVE DEPARTMENT OF THE STATE QUARANTINE INSPECTION SERVICE
H. SCHMIDT 1/11



Determination of sample size Scenario 2

Table 1. Table of minimum sample sizes for 95% and 99% confidence levels at varying levels of detection according to lot size, hypergeometric distribution

Number of units in lot	P = 95% (confidence level)					P = 99% (confidence level)				
	% level of detection × efficacy of detection					% level of detection × efficacy of detection				
	5	2	1	0.5	0.1	5	2	1	0.5	0.1
25	24*	-	-	-	-	25*	-	-	-	-
50	39*	48	-	-	-	45*	50	-	-	-
100	45	78	95	-	-	59	90	99	-	-
200	51	105	155	190	-	73	136	180	198	-
300	54	117	189	285*	-	78	160	235	297*	-
400	55	124	211	311	-	81	174	273	360	-
500	56	129	225	388*	-	83	183	300	450*	-
600	56	132	235	379	-	84	190	321	470	-
700	57	134	243	442*	-	85	195	336	549*	-
800	57	136	249	421	-	85	199	349	546	-
900	57	137	254	474*	-	86	202	359	615*	-
1 000	57	138	258	450	950	86	204	368	601	990
2 000	58	143	277	517	1553	88	216	410	737	1800
3 000	58	145	284	542	1895	89	220	425	792	2353
4 000	58	146	288	556	2108	89	222	433	821	2735
5 000	59	147	290	564	2253	89	223	438	840	3009
6 000	59	147	291	569	2358	90	224	442	852	3214
7 000	59	147	292	573	2437	90	225	444	861	3373
8 000	59	147	293	576	2498	90	225	446	868	3500
9 000	59	148	294	579	2548	90	226	447	874	3604
10 000	59	148	294	581	2588	90	226	448	878	3689
20 000	59	148	296	589	2781	90	227	453	898	4112
30 000	59	148	297	592	2850	90	228	455	905	4268
40 000	59	149	297	594	2885	90	228	456	909	4348
50 000	59	149	298	595	2907	90	228	457	911	4398
60 000	59	149	298	595	2921	90	228	457	912	4431
70 000	59	149	298	596	2932	90	228	457	913	4455
80 000	59	149	298	596	2939	90	228	457	914	4473
90 000	59	149	298	596	2945	90	228	458	915	4488
100 000	59	149	298	596	2950	90	228	458	915	4499
200 000+	59	149	298	597	2972	90	228	458	917	4551

The hypergeometric distribution is appropriate to describe the probability of finding a pest in a relatively small lot. A lot is considered as small when the sample size is more than 5% of the lot size. In this case, sampling of one unit from the lot affects the probability of finding an infested unit in the next unit selected. Hypergeometric-based sampling is based on sampling without replacement.



Determination of sample size Scenario 2

Table 1: Table of minimum sample sizes for 95% and 99% confidence levels at varying levels of detection according to lot size, hypergeometric distribution

Number of units in lot	P = 95% (confidence level)					P = 99% (confidence level)				
	% level of detection × efficacy of detection					% level of detection × efficacy of detection				
	5	2	1	0.5	0.1	5	2	1	0.5	0.1
25	24*	-	-	-	-	25*	-	-	-	-
50	39*	48	-	-	-	45*	50	-	-	-
100	45	78	95	-	-	59	90	99	-	-
200	51	105	155	190	-	73	136	180	198	-
300	54	117	189	285*	-	78	160	235	297*	-
400	55	124	211	311	-	81	174	273	360	-
500	56	129	225	388*	-	83	183	300	450*	-
600	56	132	235	379	-	84	190	321	470	-
700	57	134	243	442*	-	85	195	336	549*	-
800	57	136	249	421	-	85	199	349	546	-
900	57	137	254	474*	-	86	202	359	615*	-
1 000	57	138	258	450	950	86	204	368	601	990
2 000	58	143	277	517	1553	88	216	410	737	1800
3 000	58	145	284	542	1895	89	220	425	792	2353
4 000	58	146	288	556	2108	89	222	433	821	2735
5 000	59	147	290	564	2253	89	223	438	840	3009
6 000	59	147	291	569	2358	90	224	442	852	3214
7 000	59	147	292	573	2437	90	225	444	861	3373
8 000	59	147	293	576	2498	90	225	446	868	3500
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10 000	59	148	294	581	2588	90	226	448	878	3689
20 000	59	148	296	589	2781	90	227	453	898	4112
30 000	59	148	297	592	2850	90	228	455	905	4268
40 000	59	149	297	594	2885	90	228	456	909	4348
50 000	59	149	298	595	2907	90	228	457	911	4398
60 000	59	149	298	595	2921	90	228	457	912	4431
70 000	59	149	298	596	2932	90	228	457	913	4455
80 000	59	149	298	596	2939	90	228	457	914	4473
90 000	59	149	298	596	2945	90	228	458	915	4488
100 000	59	149	298	596	2950	90	228	458	915	4499
200 000+	59	149	298	597	2972	90	228	458	917	4551

Table 3: Table of sample sizes for 95% and 99% confidence levels at varying levels of detection, according to efficacy values where lot size is large and sufficiently mixed, binomial distribution

% efficacy	P = 95% (confidence level)					P = 99% (confidence level)				
	% level of detection					% level of detection				
	5	2	1	0.5	0.1	5	2	1	0.5	0.1
100	59	149	299	598	2995	90	228	459	919	4603
99	60	150	302	604	3025	91	231	463	929	4650
95	62	157	314	630	3152	95	241	483	968	4846
90	66	165	332	665	3328	101	254	510	1022	5115
85	69	175	351	704	3523	107	269	540	1082	5416
80	74	186	373	748	3744	113	286	574	1149	5755
75	79	199	398	798	3993	121	305	612	1226	6138
50	119	299	598	1197	5990	182	459	919	1840	9209
25	239	598	1197	2396	11982	367	919	1840	3682	18419
10	598	1497	2995	5990	29956	919	2301	4603	9209	46050

Table 4: Table of sample sizes for 95% and 99% confidence levels at varying levels of detection, according to efficacy values where lot size is large and sufficiently mixed, Poisson distribution

% efficacy	P = 95% (confidence level)					P = 99% (confidence level)				
	% level of detection					% level of detection				
	5	2	1	0.5	0.1	5	2	1	0.5	0.1
100	60	150	300	600	2996	93	231	461	922	4606
99	61	152	303	606	3026	94	233	466	931	4652
95	64	158	316	631	3154	97	243	485	970	4848
90	67	167	333	666	3329	103	256	512	1024	5117
85	71	177	353	705	3525	109	271	542	1084	5418
80	75	188	375	749	3745	116	288	576	1152	5757
75	80	200	400	799	3995	123	308	615	1229	6141
50	120	300	600	1199	5992	185	461	922	1843	9211
25	240	600	1199	2397	11983	369	922	1843	3685	18421
10	600	1498	2996	5992	29958	922	2303	4606	9211	46052

The hypergeometric distribution is appropriate to describe the probability of finding a pest in a relatively small lot. A lot is considered as small when the sample size is more than 5% of the lot size. In this case, sampling of one unit from the lot affects the probability of finding an infested unit in the next unit selected. Hypergeometric-based sampling is based on sampling without replacement.



Determination of sample size Scenario 2

中华人民共和国出入境检验检疫
ENTRY-EXIT INSPECTION AND QUARANTINE
OF THE PEOPLE'S REPUBLIC OF CHINA
植物检疫证书
PHYTOSANITARY CERTIFICATE
编号 No.: G201201020048

原产国名称及地址
Name and Address of Consignor: BEIJING HEEB INC. VIA QIANGTAI'S STORE CABALICHOE (CIVIL) ITALY
收货人名称及地址
Name and Address of Consignee: LYCOPERIDUM BENEDETTUM
品名: 植物学名: 拉丁文名称: LYCOPERIDUM BENEDETTUM
名称: TOMATO SEEDS Botanical Name of Plant: LYCOPERIDUM BENEDETTUM
数量
Quantity Declared: **08.1**KG 标记及号码
包数/件数及数量
Number and Type of Packages: 22220 50KG
产地: GAMBELGHIRIA
Place of Origin: GAMBELGHIRIA
目的地/口岸
Port of Destination: ZURICH, SWITZERLAND
运输工具
Means of Conveyance: BY AIR 检验日期
Date of Inspection: 4 NOV 2013

兹证明上述植物、植物产品或其他检疫物已按照规定程序进行检验和/或检验，未发现有害生物。特此证明。
This is to certify that the plants, plant products or other regulated articles described above have been inspected and/or tested according to appropriate procedures and are considered to be free from quarantine pests specified by the importing country/region, and practically free from other quarantine pests, and that they are considered to conform with the current phytosanitary requirements of the importing country/region.

处理: 灭天敌处理 DISINFESTATION AND/OR INSPECTION TREATMENT
日期: *** 药剂名称: ***
处理方法: *** 处理环境温度: ***
Treatment: *** 处理时间/温度: ***

附加声明 ADDITIONAL DECLARATION
NO ADDITIONAL

检验地点 Place of Issue: LANZHOU 签发日期 Date of Issue: 4 NOV 2013
授权签字人 Authorized Officer: ZHANG LIPING 签名 Signature: [Signature]

	weight(g)	seed/g	Total seeds	sample size (hygrometric 99%/01%)	sample size (binomial 99%/C)	sample size (Poisson 99%/01%)
Lot 120	5000	300	1500000	4551	4603	4606
Lot 121	8900	300	2670000	4551	4603	4606
Lot 122	9800	300	2940000	4551	4603	4606
Lot 123	2500	300	750000	4551	4603	4606
Lot 124	15800	300	4740000	4551	4603	4606
Lot 125	8400	300	2520000	4551	4603	4606
Lot 126	5800	300	1740000	4551	4603	4606
Lot 127	12100	300	3630000	4551	4603	4606



Sampling of small lots of seed

Scenario 3:

Import of 0.5 kg seeds of *Solanum lycopersicum* seeds from the Breeding company “New Seeds for all” from Argentina. The consignment consists of 100 new varieties of seeds of *Solanum lycopersicum* (Nr. A1 – A100).

Each lot consists of 5 g seeds (about 300 seeds/g).



Sampling of small lots of seed

Scenario 3:

Import of 0.5 kg seeds of *Solanum lycopersicum* seeds from the Breeding company “New Seeds for all” from Argentina. The consignment consists of 100 new varieties of seeds of *Solanum lycopersicum* (Nr. A1 – A100).

Each lot consists of 5 g seeds (about 300 seeds/g).

What possibilities do we have:

- Sample individual lots.
- Making a mixture of all lots!
- No sampling, but restrikt the use of the seeds.
- No sampling and do precautionary measures.