Late Blight, other major potato diseases in Georgia and production of healthy potato seed

Zurab Khidesheli
Georgian Scientific-Research Center of Agriculture
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Georgia is a country in Caucasus, located at the intersections of Western Asia and Eastern Europe.

It borders the Black Sea to the west, Russia to the north, Turkey and Armenia to the south, Azerbaijan to the south-east. Georgia covers a territory of 70 000 square kilometers, and population is about 3.7 million.

Climat of Georgia

There are almost all types of subtropical climate belt in Georgia. The highland regions have a dry and mild continental climate. Their influence creates especial environment for development of agricultural crops. However at the same time, the local natural-climatic conditions are also favorable for reproduction and development of plant pests, including potato diseases.

Agriculture is vital for Georgian livelihoods, with 51% of households involved in agricultural production. Potato is an essential food staple and a critical crop for rural livelihoods in the Republic of Georgia, where many phytosanitary risks threaten production. Potato is an important crop in Georgia, with approximately 25 000 ha under production. The average consumption of potato in Georgia is around 55 kg per person per year, eaten mostly as fresh produce. This is well above the world average of around 33 kg., which indicates the importance of this culture in Georgia. Potato yields vary greatly across the country due to the wide range of agroecologic zones and farming practices, but average yields from 2015 to 2019 fluctuated up to 15 t/ha, in contrast to yields in high-income countries which can be greater than 50 t/ha. This yield gap is staggering for a country where potato is so important. Georgia's low productivity makes the nation's potato production particularly vulnerable to the risks imposed by new and emerging pathogens and other system shocks and stressors.

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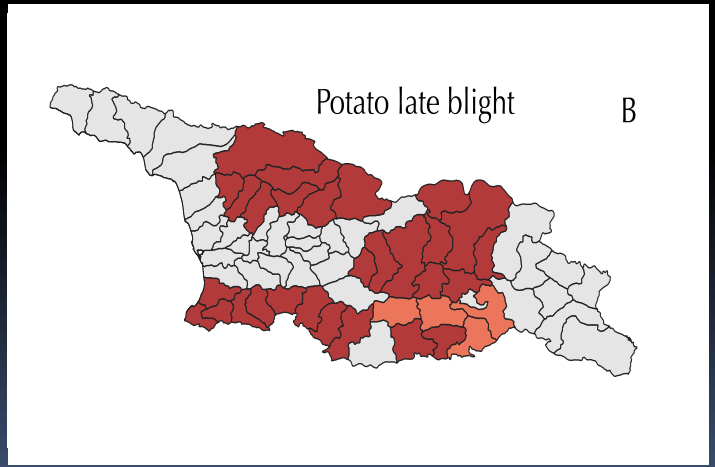
In Georgia, potatoes are subject to several serious diseases that are caused by various types of fungi, bacteria, viruses and phytoplasmas.

Among other diseases of potato, Late Blight (*Phytophthora infestans*) is the most common and harmful disease. It is widespread both in low-lying and high-mountainous regions, both on early and late potatoes, and is characterized by great harmfulness.



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The current situation

One of the reasons for the low harvest is Late Blight potatoes. In general, the following factors contribute to the spread of Late Blight:

- Late Blight are generally more severe when potatoes are produced in monoculture, when old infected seed pieces are used for planting, and when effective diseases management programs are not developed and implemented;
- Deficiency of healthy seed materials;
- Poor phytosanitary conditions and risks of spreading of a large number of harmful organisms;

The main ways to rectify the situation

In Georgia, control over Late Blight is carried out by the same methods that are accepted around the world:

- Use highly reproductive certified seed materials;
- Select disease and pest resistant cultivars;
- Use high quality fungicides, insecticides and herbicides;

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Major fungal diseases of potato in Georgia

Late Blight (*Phytophtora infestans*)

A more effective way to combat Late Blight potatoes is through chemical fight. In Georgia, mainly fungicides are used against Late Blight, which contain the following active ingredients: Copper hydroxide, Copper sulphate, Copper Chloride, Fluoxynam, Iprovalicarb, Mancozeb, Famoxadone, Mephenoxam, Cymoxanil, Fluocinam, Fenamidone, Dimetomorph, Metalaxyl, Mandipropamide, Methiram, Fluazinam, etc.

Mainly used fungicides against potato late blight in Georgia

Fungicide	Active substance	Production company	Country of production	Consumption rate per 1 ha
Kosaid	Copper hydroxide 53.8%	Kocide LLC	USA	2-3 kg
Dithan	Mankoceb 800 g/kg	Dow Agrosciences	Brasil	2 kg
Nando	Fluazinam 500 g/l	Nufarm GmbH	France	0.3-0.4 L
Limai	Amisulbrom 200g/l	Nissan Chemical	Japan	0.5 L
Champion	Copper hydroxide 770 g/kg	Nufarm GmbH	France	2.5-3 kg
Valbon	Benthiavalicarb isopropyl 17.5 g/kg + Mankoceb 700 g/kg	Kumiai cemikal indastri	Japan	1.6 kg
Kurzat R	Cymoxanil 42g/kg + Copper oxychloride 689.5 g/kg	Corveta Agriscience	Italy	2-2.5 kg
Tanos	Famoxadone 2.5 g/l+Cymoxanil 2.5 g/l	Corveta Agriscience	Italy	0.6 kg
Bravo	Chlorotalonil 500g/l	Syngenta	Switzerland	2.2-3 L
Pergado Cu	Mandipromamid 25g/kg+ Copper oxychloride 245 g/kg	Syngenta	Switzerland	4-5 kg
Ridomil Gold	Mancozeb 640 g/kg+mefenoxam 40 g/kg	Syngenta	Switzerland	3 kg
Revus Top	Mandipropamid250g/l+difekonazol250g/l	Syngenta	Switzerland	0.6 L
Infinito	Fluopicolid 62.5g/l+Prokamocarb Hydrochloride 625 g/l	BAYER	Germany	1.2-1.6 L
Melody Duo	Iprovalicarb 55g/kg+ Propynes 613 g/kg	BAYER	Germany	2-2.5 kg
Antrakol	Propynes 700 g/kg	BAYER	Germany	1.5-2.5 kg
Acrobat	Dimethomorph 90 g/kg+Mancozeb 600g/kg	BASF	Germany	2 kg
Polyram	Methyram 700 g/kg	BASF	Germany	1.5-2.5 kg
Karpez	Cymoxanil 5% + Mancozeb 45%	Agrobest	Turkey	3 kg
Pathamil	Metalaxyl 8% + Mancozeb 64%	Agrobest	Turkey	2-2.5 kg
Ossiclor	Copper oxychloride 500 g/kg	Manica	Italy	2.5-3 kg
Leader	Dimethomorph 90 g/kg+Mancozeb 600g/k	Nihgbo Sunjoy Agrosciens	China	2.5 kg
Bordoflo	Bordeaux mixture 124 g/l	Manica	Italy	2.4-3.2 L
Safacol	Propynes 700 g/kg+ Cymoxanil 60 g/kg	SAFA TARIM	Turkey	2-2.5 kg

Major fungal diseases of potato in Georgia

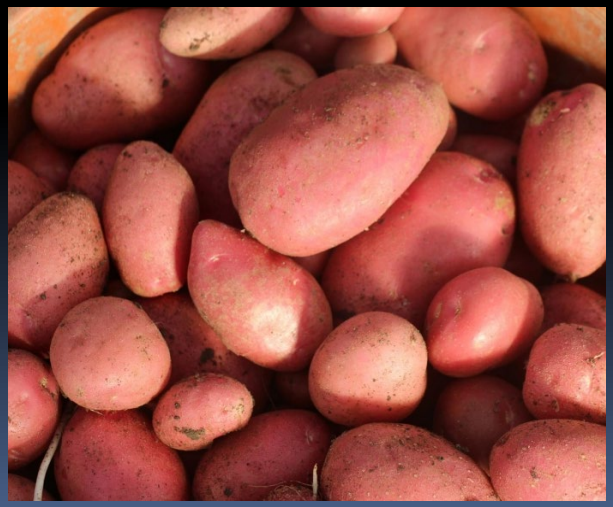
Late Blight(*Phytophtora infestans*)

In organic farming, especially in mountainous areas where beekeepers produce honey, mainly apply the processing of potato seeds and leaf dressing with liquid bio-organic fertilizers in order to enhance immunity. For example, organic-bacterial fertilizer "Organika", based on plant residues; “Bactofert” - organic-bacterial and mineral fertilizer with microelements based on zeolite.

Biological fungicides are also used, such as “Agrocatena” (Bacillus subtilis BA) - Georgia, “Phytocatena” (Pseudomonas Fluorescens BA) - Georgia, “Timorex gold” (Etheric Oil of Melaleuca Alternifolia) - USA, “Agat-25K “ (Pseudomonas aureofaciens H16 100g/ha) Russia, “Ovnier” (Ampelomyces quisqualis) Turkey, etc.

Major fungal diseases of potato in Georgia

Late Blight(*Phytophtora infestans*)



Much attention is given to the use of potato varieties resistant to Late Blight.
Georgia has been collaborating with the International Potato Center (CIP) for many years. Tested many CIP clones. Comparative resistance to Late Blight and other diseases, as well as high productivity and quality, were shown by the clone CIP “Unika”, which was registered under the name “Meskhuri Tsiteli”.

Potato varieties resistant to Late Blight

Among the potato varieties common in Georgia, the following are relatively resistant to late blitgh:

- Impala, Picasso, Sante, Amorosa, Marfona, Arizona, Condor-"Agrico" (Holland)
- Jelly, Captiva, Red Fantasy, bellarosa, Marabelle – “Europlant” (Germany)
- Carrera, Carlita, Farida, Lusinda, Monaliza, Panamera - HZPC (Holland)
- Agria, Desire, Spunta - “Stet Holland” (Holland)
- Meskhur Tsiteli, Javakheti - SRCA (Georgia).

Of these varieties, the most common are 5 varieties: Jelly, Marfona, Agria, Picasso, Sante, that occupy 65% of the total sown area.

It should be noted that, according to experts, this trend is observed for many major food crops in Asia, that is, a trend of low variety diversification.

Influence of climatic factors on potato late blight

Over the past 10 years, the amount of precipitation in May-June in Georgia has increased by 9%, and according to the data of the last 5 years by 18%. At the same time, against the background of global warming, the maximum temperature has increased.

Potato Late blight has become so aggressive that it can spread in a wide range of air temperatures from 3 to 30^0 C, and depending on the amount of precipitation, the distribution area of the fungus changes significantly and yield losses reach 70%. Observations have shown that potato late blight epiphytoties are repeated after 4-5 years.

“AsiaBlight” Project

In 2016-2018, the IPM department of the Georgian Agricultural Research Center was included in the AsiaBlight international project.
Many thanks to the Dr. Louise Cooke – Queen University Belfast, Ireland, Dr. Lei Wu - Inner Mongolia University, China.

"AsiaBlight" Project

Within the framework of the AsiaBlight project , a route survey was conducted in Tsalka, Ninotsminda, Akhaltsikhe and Akhalkalaki Municipalities for potato Late Blight mapping. Phytophthora infected potato leaves samples were collected and with the special envelop FTA cards were sent to People's Republic of China, At the Inner Mongolia University.

These samples were collected only in one, in the southern region of Georgia. If possible in the future, we will collect samples in other regions.

Sampling *Phytophthora infestans* DNA using FTA cards

"AsiaBlight" Project

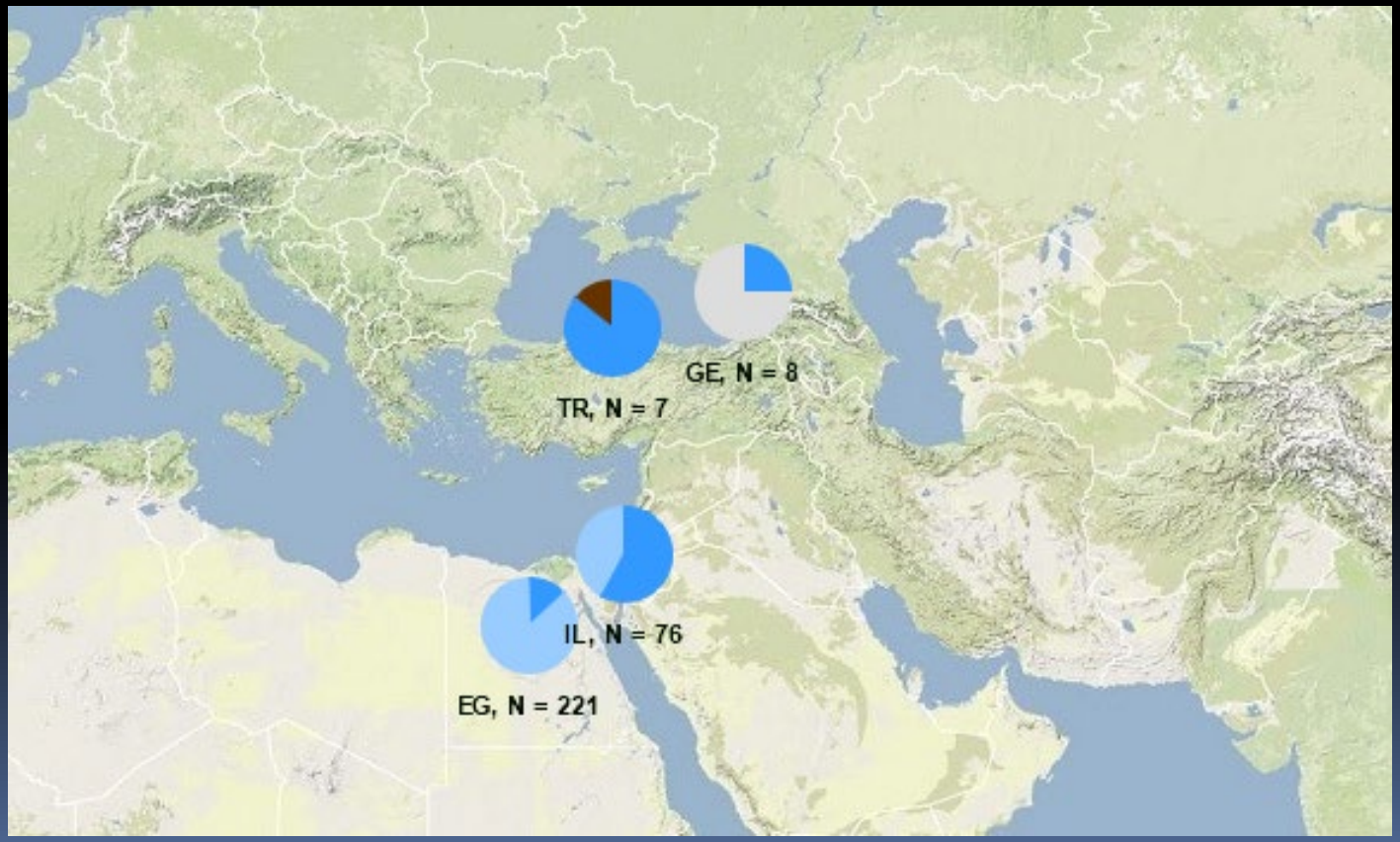
Genotyping of samples sent from Georgia took place in the laboratories of David Cook (Dundee, Scotland) and Ruofang Zhang (Hohhot, China). Five were classified as miscellaneous, one was a genotype resembling a known Russian type (misc_RU) and two were the aggressive genotype 13_A2 (Blue 13).

FTA Card No.	Sampler name	Country	Nearest Town	GPS coordinates (decimal or degrees, minutes, seconds)		Date Sampled	Cultivar	Genotype (JHI 2019)
				Latitude	Longitude			
1	Zurab Khidesheli	Georgia	Akhalqalaqi, village Apnia	41.38335N	43.51992E	17.08.2018	Laura	fail
2	Zurab Khidesheli	Georgia	Akhalqalaqi,, village Okami	41.25573N	43.51902E	17.08.2018	Jeli	fail
3	Zurab Khidesheli	Georgia	Aspindza, village Niala	41.38335N	43.51992E	17.08.2018	unfamiliar	misc
4	Zurab Khidesheli	Georgia	Tsalka, village Beshtasheni	41.25573N	43.51902E	23.08.2018	Agria	misc
5	Zurab Khidesheli	Georgia	Ninotsminda, village Gondura	41.38123N	43.34917E	23.08.2018	Marfona	misc
6	Zurab Khidesheli	Georgia	Ninotsminda, village Mamzara	41.38115N	43.34916E	23.08.2018	unfamiliar	misc
7	Zurab Khidesheli	Georgia	Ninotsminda, village Khanchali	41.36819N	43.21530E	23.08.2018	Marfona	misc_RU
8	Zurab Khidesheli	Georgia	Khulo, village Riketi	41.63167N	42.51000E	25.08.2018	Silvana	misc
9	Zurab Khidesheli	Georgia	Khulo, village Danisparauli	41.59889N	42.46972E	25.08.2018	Melano	13_A2
10	Zurab Khidesheli	Georgia	Khulo, village Goderdzi	41.35605N	42.28876N	25.08.2018	Silvana	13_A2

"AsiaBlight" Project

Information was loaded on a map of **EuroBlight 2019**.

http://agro.au.dk/forskning/internationale-platforme/euroblight/pathogen-characteristics-and-host-resistance/genotype-frequency-map/



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Major fungal diseases of potato in Georgia

Alternariosis/macrosporiosis of potatoes (*Alternaria solani*)

The second most common disease in Georgia is Alternaria potato disease caused by the fungus Alternaria solani. Unfortunately, farmers are mistaken in the fight against Alternaria. They do not pay attention to Alternariosis. Against late blight and early blight, the same fungicides are used and at the same time. Many do not know that fungicides that are used against late blight are not effective against Alternaria.

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Major fungal diseases of potato in Georgia

Alternariosis/macrosporiosis of potatoes (*Alternaria solani*)

For example:

Fungicides recommended against Late blite but not recommended against Alternaria

Fungicide	Active substance	Production company	Country of production	Consumption rate per 1 ha
Kocide	Copper hydroxide 53.8%	Kocide LLC	USA	2-3 kg
Nando	Fluazinam 500 g/l	Nufarm GmbH	France	0.3-0.4 L
Limai	Amisulbrom 200g/l	Nissan Chemical	Japan	0.5 L
Champion	Copper hydroxide 770 g/kg	Nufarm GmbH	France	2.5-3 kg
Valbon	Benthiavalicarb isopropyl 17.5 g/kg + Mankoceb 700 g/kg	Kumiai cemikal indastri	Japan	1.6 kg
Kurzat R	Cymoxanil 42g/kg + Copper oxychloride 689.5 g/kg	Corveta Agriscience	Italy	2-2.5 kg
Pergado Cu	Mandipropamid 25g/kg+ Copper oxychloride 245 g/kg	Syngenta	Switzerland	4-5 kg
Karpez	Cymoxanil 5% + Mancozeb 45%	Agrobest	Turkey	3 kg

Major fungal diseases of potato in Georgia

Alternariosis/macrosporiosis of potatoes (*Alternaria solani*)

And at the same time, there are fungicides that are recommended only against Alternaria, for example:

Fungicide	Active substance	Production company	Country of production	Consumption rate per 1 ha
Scort	Difenoconazole 250 g/l	Arusta LifeScience	Germany	0.3-0.35 L
Nativo	Trifloksistrobine 250 g/kg+ Tebukonazole 500 g/kg	BAYER	Germany	0.25-0.35 kg
Aplore	Difenoconazole 250 g/l	Agrobest	Turkey	0.3-0.5 L
Karnaval	Iprodione 500 g/kg	Agrobest	Turkey	0.6 kg
Rovone	Iprodione 500 g/kg	SAFA TARIM	Turkey	0.6 kg
Tilzim	Tebukonazole 250 g/kg	SAFA TARIM	Turkey	0.5 kg
Cideli Top	Difenoconazole 125 g/l+Ciflufenamid 15 g/l	Syngenta	Switzerland	1 kg
Afet	Penthiopyrade 200 g/l	Mitsui Chemical Agro	Japan	1.2-1.3 L

From these two tables it can be seen that against **late blight**, fungicides are mainly used that contain Cymoxanil, Mancozeb, Mandipropamid, Copper oxychloride, Copper hydroxide, Fluazinam etc. Against **Alternaria**, fungicides are mainly used that contain Difenoconazole, Tebukonazole, Iprodione, Ciflufenamid, Penthiopyrade etc.

Main fungal diseases of potato in Georgia

The main fungal diseases of potatoes in Georgia are also:

Potato rhizoctonia
(*Rhizoctonia solani*)

Potato common scab
(*Streptomyces scabies*)

Potato powdery scab
(*Spongospora subterranean*)

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Major bacterial diseases of potato in Georgia

Potato black leg (*Pectobacterium phytophtorum*)

Potato quarantine diseases in Georgia

Potato cancer (*Synchitrium endobioticum*)

One disease of urgent, emerging concern in Georgia is potato wart (caused by Synchytrium endobioticum), also known by the common names black scab, potato tumor, and potato cancer. S. endobioticum can be a devastating pathogen and is considered one of the most important quarantined pathogens for potato, such that many countries have implemented strict regulation to prevent introduction.

Potato wart appears to be primarily spread by humans through infected seed potato tubers, making potato wart a high risk for seed systems where there is little or no control of phytosanitary quality, and an important consideration for international fresh potato trade.

Potato quarantine diseases in Georgia

Potato cancer (*Synchitrium endobioticum*)

Potato cancer has spread in one highland region of Georgia.
Infected tubers are unusable. Crop loss can be 40-60%.

Control measures:

- Growing resistant varieties.
- Compliance with a 5-6 year crop rotation.
- Processing infected soil with Nemasol-Sodiumium methyldithiocarbamate (60-120 g / m2) or Bazamide-Dazomet (60-80 g / m2).

Potato canker (Synchithrium endobioticum)

- In 2019 it was confirmed that at least two isolates from Georgia resemble the aggressive pathotype 38, a pathotype previously only detected in Turkey.
- The presence of this pathotype has been attributed to the high volume of ware potato imported from Turkey to Georgia during the period of introduction.

Potato canker (Synchithrium endobioticum)

We set up experiments and identified potato varieties resistant to potato cancer. More than 20 potato varieties were tested. 7 of them showed resistance to the disease, among them 2 Georgian varieties, which were obtained from CIP clones and registered under the name: Javakheturi, Meskhuri Red (SRCA-CIP). As well as European varieties Silvana, Farida, Panamera (HZPC-Holland).), Barcelona (Solanum International-Canada), Condor (Agroplant-Holland).

Potato canker resistant cultivars test plot in the High mountain (Khulo) District.

Potato canker (Synchithrium endobioticum)

According to our data, the Government of Georgia purchased and distributed free of charge 200 tons of seed potato variety "silvana" (HZPS Netherlands) to the population of Khulo, a small (710 square kilometers, 24,000 population) highland district, where potato cancer was prevalent.

As a result, the phytosanitary condition of potato crops in the district improved significantly.

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Potato viral diseases in Georgia

In the Scientific Research Center of Agriculture of Georgia, the fight against viral diseases of potatoes is being carried out especially intensively. Viral diseases are widespread and cause great damage to potato production in Georgia. The spread of viral diseases was caused by an imperfect potato breeding system. Their control has become especially important when mandatory certification of potato seeds is planned in Georgia from 2024. There was a need for more research on viral diseases, as well as training for seed potato farmers on the symptoms and management of viral diseases.

Of the viral diseases in Georgia, the most common
Potato ordinary mosaic, caused by PVX

Potato viral diseases in Georgia

Also high spread wrinkled mosaic PVY

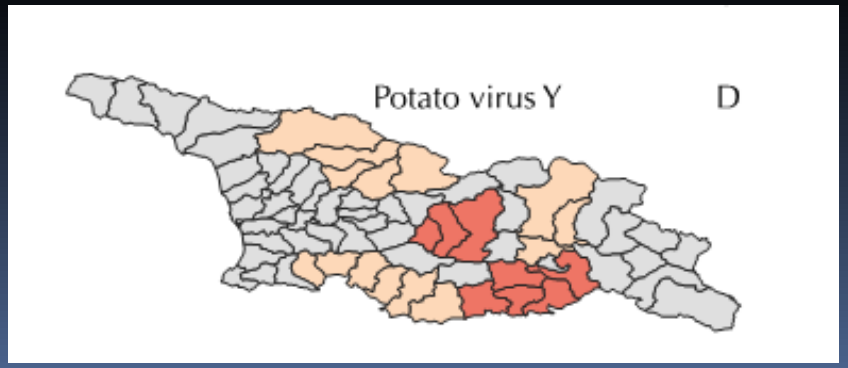
Co-distribution is very common

Potato ordinary mosaic PVX + wrinkled mosaic PVY

Potato viral diseases in Georgia

In Georgia, it is also common Potato leafroll, PLRV And Potato rollmosaic, PVM

We apply preventive measures against viral diseases: the fight against vectors and weeds - reserv of infection. But the most important use of virus-free seed material.



Phytoplasmic diseases of potatoes

In Georgia, there is also a phytoplasmic disease of potatoes - stolbur wilt. Under the conditions of Georgia the vector of this disease is the leafhopper - *Hyalestes obsoletus*.

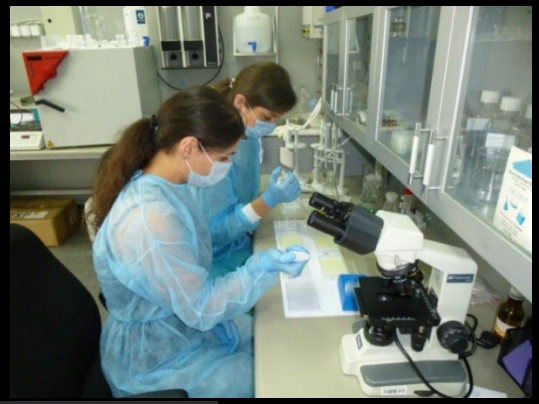
A weed, Convolvulus arvensis, is a reservoir of phytoplasma infection.

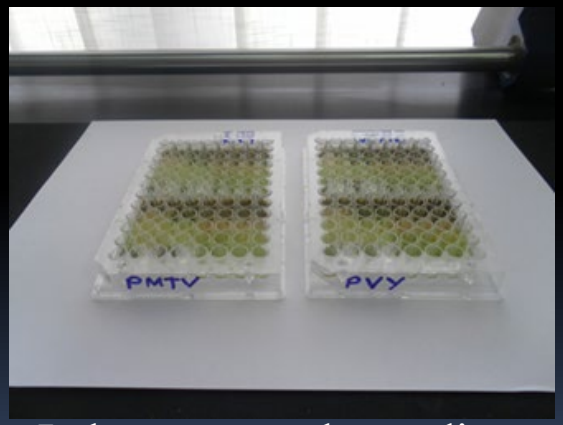
Hyalestes obsoletus

Convolvulus arvensis

Laboratory of virology

Virus and phytoplasmic diseases diagnostics are carried out in the Virology Laboratory of the Georgian Agricultural Research Center. The laboratory is equipped with the latest scientific equipment

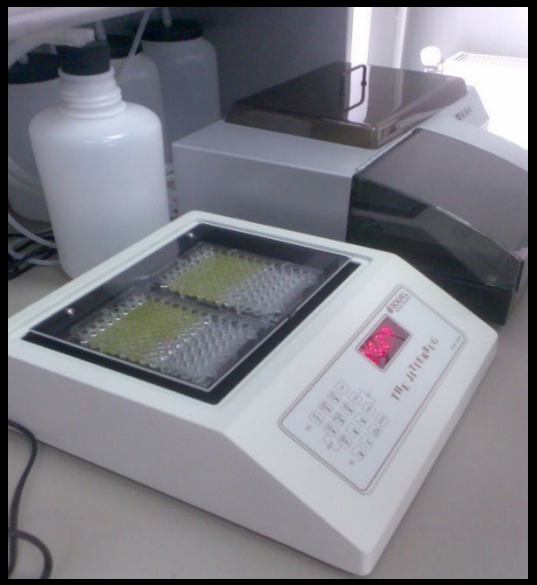


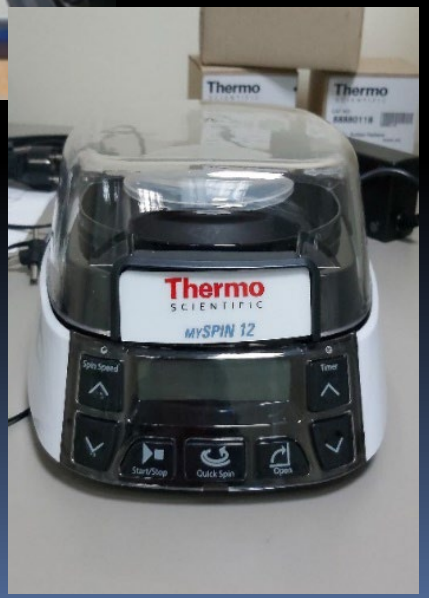


Laboratory makes a diagnosis potato viral diseases, Virological control of *in vitro* potato plants, Control by EPPO (European Plant Ptotection Organization) standards, with viral diagnostics produced by BIOREBA (Switzerland), SEDIAG (France) and LOEVE (Germany) companies.

Research methodology

The sandwich method of **Enzyme-Lynked ImmunoSorbent Assay (ELISA)** is used for the diagnosis of viral diseases of potatoes.





Research methodology

Real Time-PCR equipment
7500 Fast RT-PCR System;
Life Technology.

In the laboratory, a molecular method - real-time polymerase chain reaction (RT PCR) is used for the study of plant viral, phytoplasmic and bacterial diseases.

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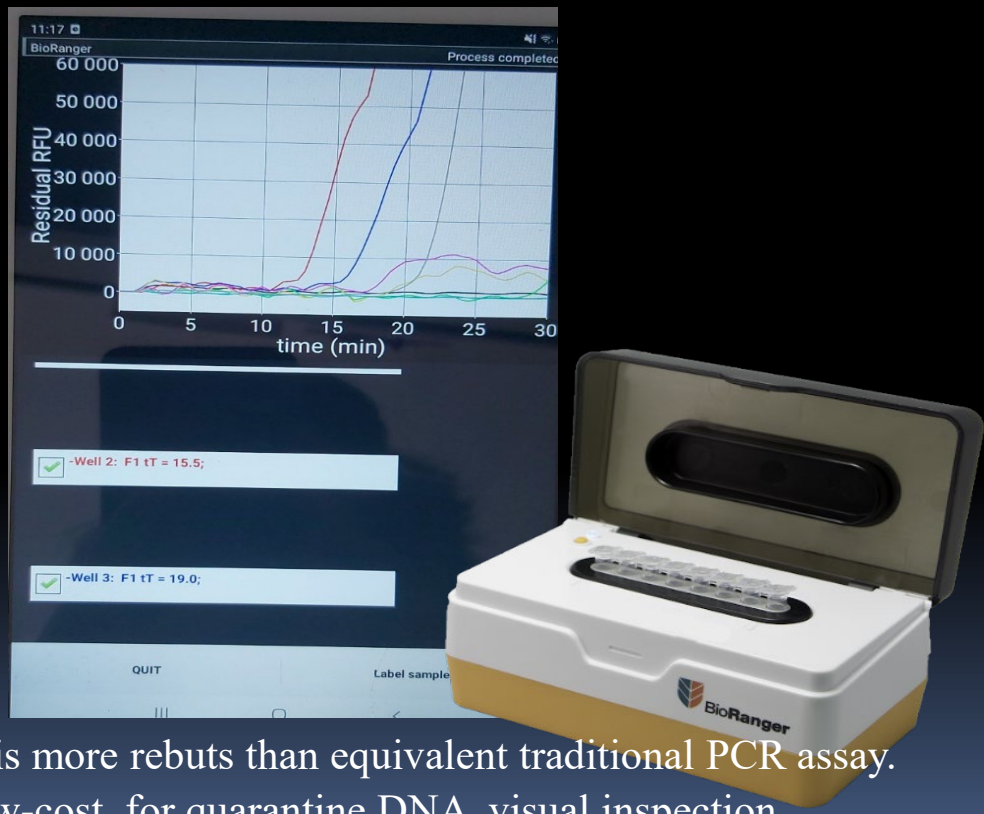
Research methodology

In recent years, we have started using a new method:

Potato viruses PVY and PLRV were tested using PCR- Loop-mediated isothermal amplification (LAMP) method, samples were analyzed using BioRanger™ (Diagenetix Inc., Honolulu, HI) a battery operated, handheld device.



It was successfully applied in field samples, it is more rebuts than equivalent traditional PCR assay. The results were obtained by 45 min, with a low-cost for quarantine DNA visual inspection, which supporting a high effective and easy processing method for plant quarantine. In particular, the proposed LAMP assay achieved a high sensitivity and specificity.

Potato seed system in Georgia

Access to formally certified potato seed ended in Georgia with the fall of the Soviet Union in 1991 and has not yet been fully reestablished.
Previously, Georgia received potato seeds from Ukraine and Belarus, produced early potatoes and sent them to Russia. After the collapse of the Soviet Union, a large shortage of seed potatoes formed in Georgia.

Potato seed system in Georgia

During the 1990s, an effort was made by the Government of Georgia to privatize and freely distribute agricultural lands (less than 1.25 ha in size), which were once state-owned. Because of these political factors, most potato farmers in Georgia are smallholders with less than 2 ha of land. These farmers source their planting material (seed) through an informal system. Potato production by most of these farms is primarily for subsistence or local sale. Some farmers with larger landholdings source potato seed directly from European seed producers, at a price that is cost-prohibitive for most smallholder farmers.

Potato seed system in Georgia

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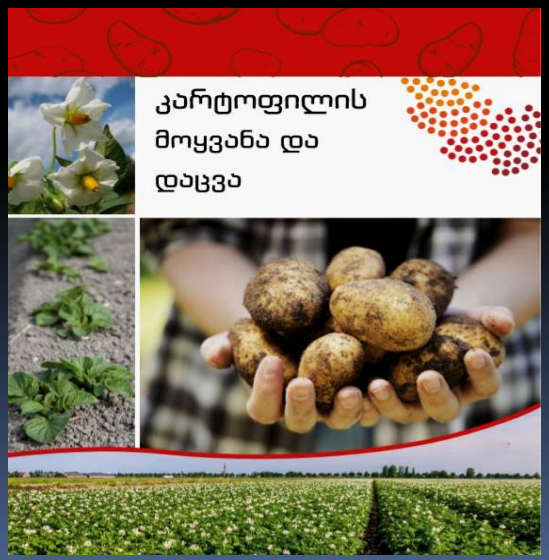
Potato seed system in Georgia

The major international sources of seed potato originate from a handful of private sector companies headquartered in Germany and the Netherlands.

One of the companies is "Kartlis Agrosystems", which offers its customers pesticides, fertilizers, seedlings, irrigation systems, inventory and so on. The company owns demonstration plots where it tests new varieties of plant crops and new production technologies.The company "Kartlis Agrosystems" is the representative of the leading European producer of high-quality seed potatoes „HZPC Holland“ in Georgia. The company was able to harvest up to 50 tons of potatoes on its demonstration plots.



Potato seed system in Georgia

International public institutions such as CIP and USAID make a great contribution to the development of the potato seed system in Georgia. They mainly act as sources of new germplasm for research or to finance research and development projects.

International Potato Center (CIP) is currently implementing a project "Enhancing Rural Livelihoods in Georgia: Introducing Integrated Seed Health Approaches to Local Potato Seed Systems", supported by Austrian Development Agency.

CIP
INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

Potato seed system in Georgia

Of particular importance for Georgia was the CIP project - Developing a Potato Seed Certification System.

Potato seed system in Georgia

This project helped Georgian partners develop a seed certification plan for Georgia. Additional concepts were developed to help make the seed system plan more successful. Our colleagues and friends Jorge L. Andrade-Piedra and Gregory Forbes actively participated in the implementation of the project. They conducted trainings for Georgian specialists and farmers, provided presentations, and also met in the field..

Georgian scientists, specialists and farmers are very grateful to Dr. Jorge for his work and help.

CIP
INTERNATIONAL POTATO CENTER
A CGIAR RESEARCH CENTER

Production of healthy potato seed

Within the project developed National Plan for Improving Seed Potato in Georgia.

Potato seed system in Georgia

Within the framework of the project, a National Plan was developed to improve the production of seed potatoes in Georgia. In lieu of complete seed replacement each year with certified stock, there are other strategies that can improve or maintain the quality of planting material. The introduction of training programs for carrying out positive selection may serve to substantially improve yields in a short time in Georgia. Extension education services may focus on positive selection to maintain seed quality over generations, and thus reduce the frequency with which new stock material would need to be purchased.

in vitro production of virus-free seed potatoes

The seed certification plan provided for assistance in the in vitro production of virus-free potato planting material. Virological control of in vitro potato plants was carried out by the Virology Laboratory of the Scientific Center for Agriculture. Virological diagnostic kits (PVY, PVX, PLRV) were supplied by CIP.

in vitro production of virus-free seed potatoes

Many CIP clones are tested against potato diseases. In the in vitro laboratory, CIP clones are propagated.

Involvement *in vitro* production of seed potatoes

Implementation of 3G technology - a laboratory, a greenhouse, a field.

USAID Potato Program in Georgia

The potato program in Georgia, which is implemented by the International Potato Center (CIP), began in 2020 and ended in 2022. As part of a three-year program, model potato seed farms were established in the high-mountain potato-growing regions. The aim of these farms was to establish a seed potato production base in Georgia, improve farmers' access to high quality seed potatoes and increase farmers' income.

USAID Potato Program in Georgia

The project is comprised of two main components with activities focused on key target areas.

The **first component** will establish a model seed farm using 3G technology and develop a potato producer network.

The **second component** will introduce new potato genotypes and improved farming practices. The project team will also ensure an effective seed potato certification system by adapting existing 'best practices' to the Georgian context and developing the protocols and field inspection guides needed to achieve certification.

USAID Potato Program in Georgia

Key outcomes

- Seed potato producers engaging in this project are expected to increase their annual sales per hectare by 233%.
- Due to enhanced access to seed potato of improved genotypes, farmers will increase their yields from an average of 12 to 25 tons per hectare.
- Another key outcome is to obtain approval from the Ministry of Environmental Protection and Agriculture on the seed potato certification process and standards. This will lead to around 50% of potato farms in the project areas gaining certification as quality seed producers.

USAID Potato Program in Georgia

The main news of the project:

For the first time in Georgia, within the framework of the project, potato seedlings were grown using a special technology through in vitro plant propagation and distributed to beneficiary farmers. Seedlings were planted in open ground and super-elite seed potatoes were obtained from it. It should be noted that the project involved mainly female farmers.

USAID Potato Program in Georgia

Potato seedlings are used to produce seed potatoes, not food potatoes.

With this technology, small but many tubers are obtained.

Mini tubers weigh 5-10 grams but have the same potency as a 60 gram tuber.

Seedlings are harvested 1-1.5 months earlier than tubers.

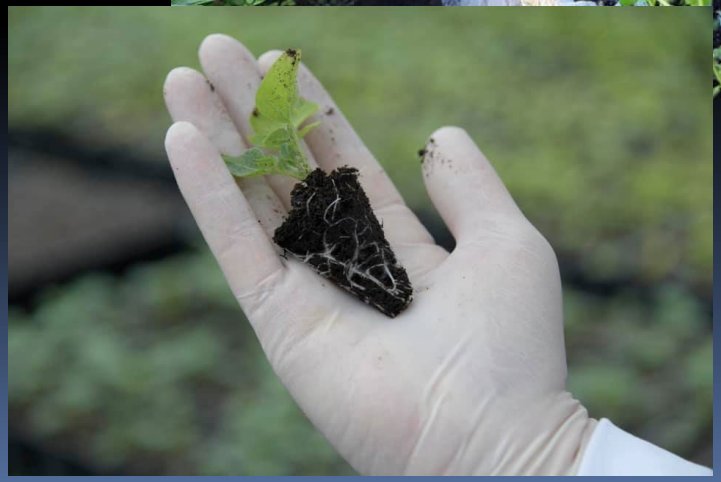
USAID Potato Program in Georgia

- 5100 beneficiaries participated in the project;
- 850 small farmers bought and planted seedlings
- Succesfully introduced 3G and other innovative approach (example: 86.3 ton certified potato seeds have harvested on 3 ha industrial plots)

USAID Potato Program in Georgia

- 200 potato seedlings were distributed to each farmer;
- about 4000 mini tubers were obtained from 200 seedlings;
- 1 seedling gives 20-30 mini tubers;
- 4000 tubers are 1000 square meters of seed material.
- 4000 tubers are about 50-60 kg in weight.
- With the best care, 80 kg of seed material can be obtained from 200 seedlings.

USAID Potato Program in Georgia



In total, about 1 million potato seedlings were produced within the program.

USAID Potato Program in Georgia

Two selected CIP varieties were registered in Georgia Under local names “Meskhuri Tsiteli” and Tskriala;

Future plans

The program developed and introduced the Seed Tracker electronic platform

Seed Tracker™

RESEARCH PROGRAM ON Roots, Tubers and Bananas

CGIAR

The Seed Tracker (ST) is a digital innovation for seed value chain integration for enhancing quality seed production and market access

The Seed Tracker offers digital data collection tools usable on any internet enabled devices (computer, laptop, mobile phone and tabs) online and offline, offers customized individual and group accounts, a database with analytics and GIS tools.

The ST Functionalities cover all stages of seed value chain, and needs of all stakeholders (researchers, extension, regulators, public-, private- and farmer-seed producers, traders and farmers). It supports seed production planning, seed traceability (from production to end-use over generations and seasons), seed inventory, real-time tracking of production status, seed certification, marketing, information resources, geographic maps and map-based data navigation, communication between users, and decision support tools.

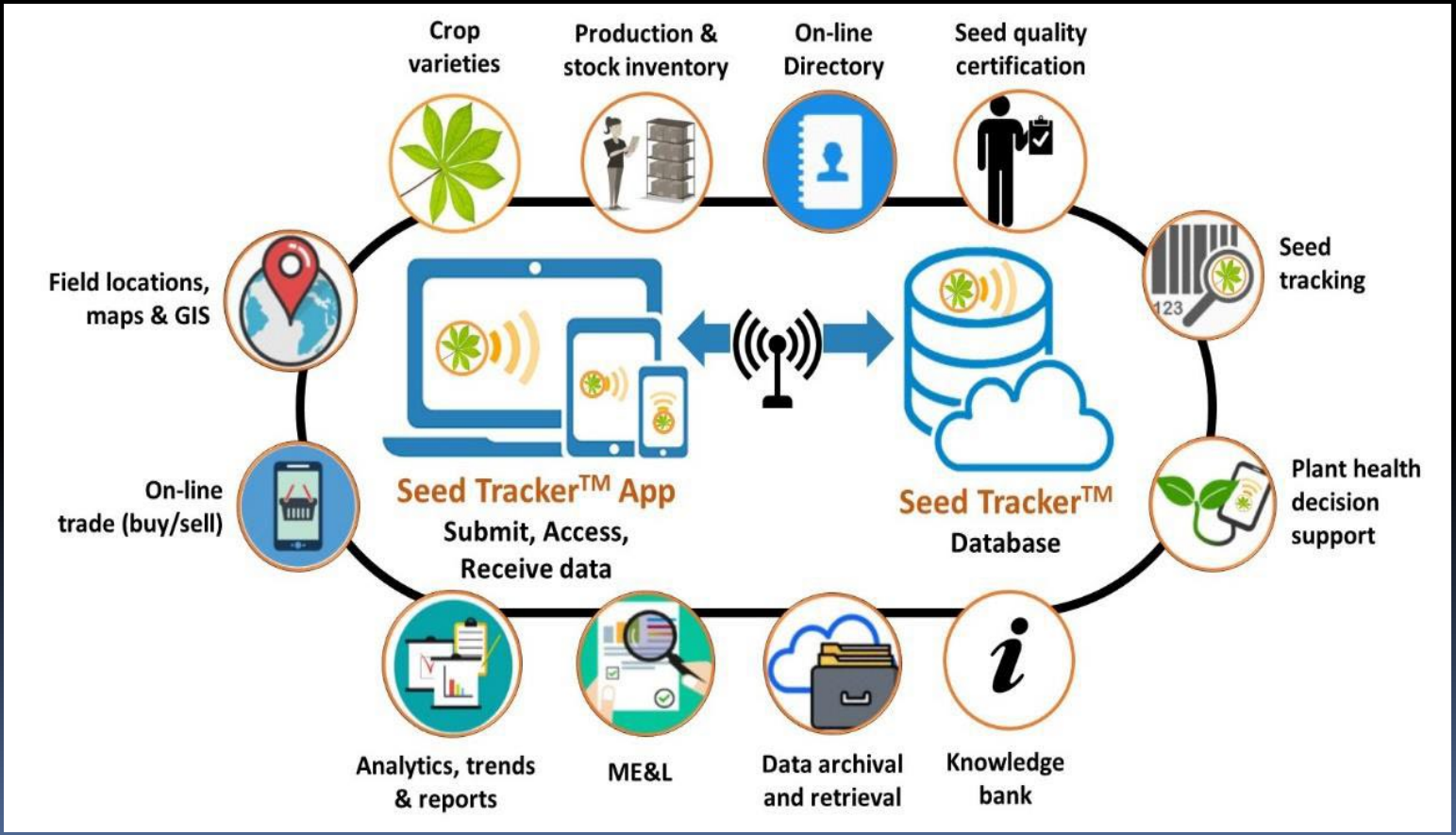
Future plans

Seed Tracker™

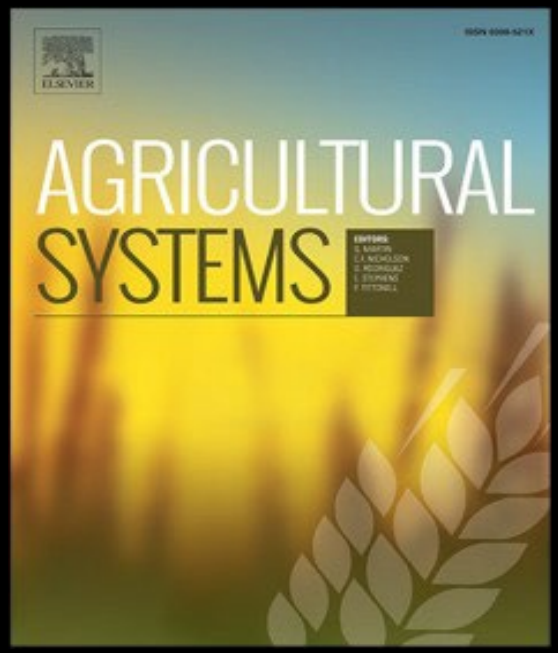
RESEARCH PROGRAM ON Roots, Tubers and Bananas

CGIAR

www.seedtracker.org



Potato seed system in Georgia



Georgia's potato seed system and pest risks were studied by a scientific team led by Kelsey F. Andersen Onofre and published in the journal Agricultural Systems.
I bring some of the ideas from this article into this presentation.

Here I propose the title of this article and interested persons can read it:

An integrated seed health strategy and phytosanitary risk assessment: Potato in the Republic of Georgia - Kelsey F. Andersen Onofre, Gregory A. Forbes, Jorge L. Andrade-Piedra, Chris E. Buddenhagen, James C. Fulton, Marcel Gatto, Zurab Khidesheli, Rusudan Mdivani, Yanru Xing, Karen A. Garrett, Agricultural Systems 191 (2021) 103144
journal homepage: www.elsevier.com/locate/agsy
https://www.sciencedirect.com/science/article/pii/S0308521X21000974

THANK YOU FOR YOUR ATTENTION!

გმადლობთ ყურადღებისთვის!