RZ Seeds & Services

RIJK ZWAAN

The right combination for the best results
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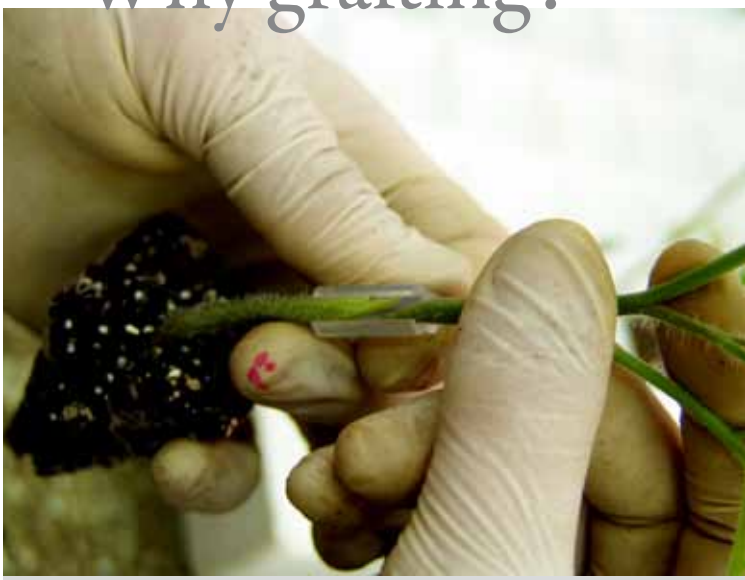
Why grafting?



Grafting is an ancestral technique coming from Asia. Since 30 years it has been widely spread to our vegetable crops, specially tomato and watermelon. There are several reasons for this development and all these reasons answer to the question: why grafting?

In the areas of intensive cultivation of vegetable crops, soil borne diseases have always been a serious problem. The reduction of chemicals for soil disinfection brought backs to the preoccupation of the grower some of these soil problems that were maybe not so important some years ago. Fusarium wilt, corky root, root-knot nematodes or Verticillium wilt are again frequent pathogens that we have to deal with. Grafting using resistant rootstock is one of the most efficient ways of protecting our crops.

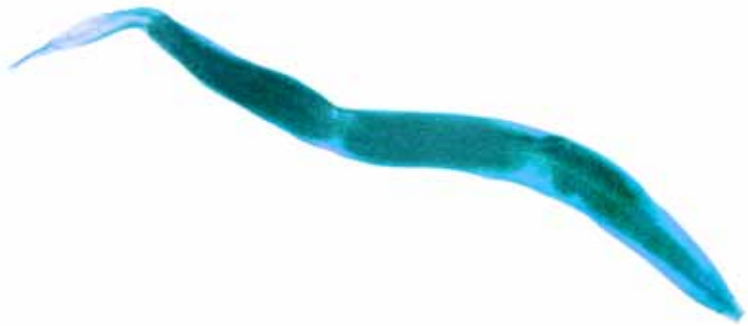
Why are the Dutch tomato growers grafting? They are growing in rockwool, with heating system and lighting, they have no problems of soil pathogens. But they are still grafting. For them, the rootstock is a very important part of the crop, as important as the variety itself. And without the help of the rootstock they couldn't reach the extra yields that make them competitive.

More than resistances, the rootstocks used nowadays offer you possibilities to grow better and longer. The strength of the root system of the rootstocks gives extra power, cold tolerance, salt tolerance, stress tolerance, better mineral and water absorption; different skills that allow you to obtain a higher yield from your crop.

The right choice of the rootstock is really important and depends on different parameters like the variety, the cycle, the growing place, the type of soil, the pathogens in the soil. In Rijk Zwaan we are convinced that only the best combination gives the best result and we would like to share our experience with you, and to offer you solutions for your own conditions.

Corine Pinkert and Johan Solleveld, nematodes and rootstocks specialist:

Nematodes, how the resistance works



Nematode picture made with microcospe lense ▶

Root-knot nematodes, Meloidogyne spp., are major pest of tomato, sweet pepper, eggplant and other vegetable crops of intensive agriculture in several areas of the Mediterranean basin. As nematicides are more and more forbidden, a management strategy is to combine non-chemical soil fumigation with grafting on rootstocks, as most rootstocks contain resistances to several soil related plant diseases like root-knot nematodes.

As the request from growers for nematode resistant rootstocks is increasing, Rijk Zwaan pays a lot of attention to this problem, in all stages of the breeding process. Sales representatives, breeders and researchers of the Phytopathology department are working together to make an inventory of nematodes all around the world causing problems in vegetable crops. This is done by collecting field samples, determining the species by PCR and the aggressivity of the nematodes by a test set. Sometimes the Dutch Plant Disease Service is asked for help. Mostly found nematodes are Meloidogyne incognita, M. javanica, M. arenaria and M. hapla, of which the first two are causing most damage. Symptoms are poor fruit yield, stunted growth, wilting and susceptibility to other pathogens.

After 10 months one susceptible tomato plant could harbor 300 thousand to 3,6 million nematodes.

From a field test of Rijk Zwaan in Italy, it was found that after 10 months one susceptible tomato plant could harbor 300 thousand to 3,6 million nematodes. When nematodes leave the egg, their body is worm-like and its size is around 400 – 500 µm. This is the stage in which nematodes infect plant roots, usually just behind the root tap. To penetrate into the root, they break down the cell wall by thrusting with their stylet and secretion of enzymes, even of plants resistant to root-knot nematodes. After, they migrate intercellularly to the cortex in the region of cell differentiation. Finally, the nematode starts feeding from a single plant cell and stays at this place for the rest of its life.

The gene has proved itself to be a reliable and durable resistance gene for over several decades.

Cells from susceptible plants react to this feeding by developing in giant cells: cell walls disappear creating one big cell with several nuclei. This cell enormously enlarges, attracting a lot of nutrients from the plant to feed the nematode. Cells around the giant cell divide and grow more rapidly, which finally forms the well known knots visible on the roots of the plants. The nematode swells and starts producing eggs, which end up in an egg mass containing around 200 eggs, located at the outside of the nematode on the root knots.

On the contrary, cells from resistant plants containing the *Mi-1.2* gene, react to the feeding of the nematode by cell death of infected and adjacent cells. In this way it prevents feeding and reproduction of the nematode. This programmed cell death, also called hypersensitive response (HR), occurs as early as 12 hours after infection. The Mi-1.2 gene was found approximately 50 years ago in S. peruvianum and was introduced into S. lycopersicon, by making a hybrid of those two species with the help of embryo rescue. The gene has proved itself to be a reliable and durable resistance gene for over several decades.

More recently however, the chance of breakage of the gene increased, probably due to restrictions in chemical nematode management and the large scale worldwide use of this gene. All over the world, reports have been made of nematode populations that were able to overcome resistance mediated by the *Mi-1.2* gene. Due to the high number of offspring, the chance on mutants causing genetic variability resulting in *Mi-1.2* gene breaking populations is strong. Apart from this, the gene only provides resistance to nematodes at a soil temperature below 28 °C.

Nematodes nomenclature

In the past the code N was used in the official resistance pattern description, to express the resistance against *Meloidogyne arenaria*, *incognita* and *javanica*. Nowadays *Ma*, *Mi* and *Mj* are used, although we are talking about the presence of one gene, working against the non aggressive *Meloidogyne* strains, below a soil temperature of 28 °C. Still it is possible to have differences between varieties in resistance levels. For this HR (high resistance) and IR (intermediate resistance) are used. Rijk Zwaan rootstocks contain the high level, in case we claim resistance.

Mr. Siciliano, Coop .OrtoQualita', Italy

"Big Power RZ and its adaptability guarantee!"

The company OrtoQualità is one of the reference points of Sicilian tomato production; it is made up of a production and a packaging division and is managed by 10 partners, occupying a total surface area of 90 covered hectares. Most of the surface area is on soil, whereas just 10 hectares are dedicated to soil-less growing in a substrate of perlite and coco peat, a surface which as Mr Siciliano, one of the managers, told us, is due to increase in the next two years reaching about 60 hectares.

Big Power RZ represents the perfect solution, thanks to its excellent affinity to the different cocktail and cherry species

The production is mainly based on cherry tomatoes both for export and the national market. OrtoQualità has chosen greater production guarantees for years now, using a grafted tomato for 100% of its total surface area. This is due to the increased health issues connected with the land, the progressive reduction in the use of chemical treatments in the soil and, not least, the need for a higher production yield. All these requirements find a single solution in the rootstock variety Big Power RZ, which has made it possible to combine elements such as resistance, vigour and productivity, but also the quality of the harvest. "In fact it is strategic for the cherry tomato to keep the quality characteristics as top priority - said Mr Siciliano - such as the weight, flavour, Brix, presentation and colour, as producing with the same plant for a long time, from autumn to spring right through the winter, could lead to serious adaptation problems.

So Big Power RZ represents the perfect solution, thanks to its excellent affinity to the different cocktail and cherry species, but also its adaptability and easy cultivation both in the soil and in soil-less systems, protecting the plant but at the same time exploiting its production performance.

Toubkal and Comaprim, Morocco

"King Kong RZ always gave us good results"

Advantaged by clement climatic conditions, the area of Agadir in the South of Morocco is an excellent place for vegetable growing. With a surface of about 10.000 ha of plastic greenhouses, the growers produce a continuous production all year-round. Apart from the cucumbers, peppers and beans, the tomato is still the leader product in term of extension. The surface for growing tomatoes was close to 5.000 ha in 2009. Round tomato is the main product with 3.500 ha.

The other specialities are getting more and more important in the last years.

Looking for export to the European markets, the growers from Agadir choose a long cycle crop, from July-August to June. However, "the monoculture system and the sandy soils increase the risk of nematodes and soil diseases attack, affecting then the production in quantity and quality" says Mr Amcassou from Coopérative Toubkal.

«Thanks to grafting my cluster tomatoes on Emperador RZ, I managed a higher vigour»

During a long time, methyl bromide has been used for soil disinfection. Nevertheless, its use has been gradually stopped according to the Montreal protocol. In this context, it was necessary to look for alternative methods. From some years ago, grafting appeared to be an essential solution to fight against soil problems. Today more than 85% of the tomatoes from Agadir are grafted.

Seeds companies opened the market to a lot of different rootstock varieties, from medium to high vigour. Leader in this area, Rijk Zwaan made available for the growers a complete and complementary range: King Kong RZ, Big Power RZ and Emperador RZ.

"For more than 5 years, King Kong RZ always gave us good results by its compatibility and affinity with the standard round tomatoes", stress Mr Amcassou. "The other advantage of King Kong is the best cold tolerance in winter and its quick recuperation after the coldest period"

Facing the lasting problem of nematodes and the challenge to get a high quality production, the introduction of Emperador RZ was a success, allowing getting stronger plants. "Thanks to grafting my cluster tomatoes on Emperador RZ, I managed a higher vigour, keeping the balance of the plant and improving the fruit size. And also the control of the nematodes attacks" declared Mr Farissi, from Coopérative Comaprim.

"Emperador RZ: the chance to choose based on your own requirements!"

Mr Salvatore Asta told us about his satisfaction in managing a farm, with a surface area of 5 hectares of soil-less growing system in coco peat, producing tomato varieties, mainly truss and mini plum. 70% of production is sold to the Italian market and 30% is for export; from next year, with the introduction of the cocktail tomato, to diversify the product range even further, exports will increase with the aim of reaching markets such as the UK, Austria and Germany.

"Nowadays - explained Mr Asta - the use of rootstock plays a vital role in soil-less growing production. Particularly in a long cycle where, in fact, as well as greater efficacy in defence against diseases, a high production yield is the key factor in minimising large production costs and providing a constant supply for the markets". After careful research the company OrtoKamarina has decided to go for the Rijk Zwaan rootstock range.

It has found a clear solution in Emperador RZ and Big Power RZ to fulfil its requirements in terms of adaptability, productivity and management of the plant.

«Big Power RZ is an excellent solution for planting at the start of the season»

The latter condition is particularly important for planting in the warmer months, such as August and September, with the aim of facing a long production cycle. "In fact – Mr Asta told us – it is strategic to obtain a good balance for the plant from the start, which means not missing out on production per square metre but at the same time building up a good vegetative structure, in order to face the more critical conditions such as, for example, the less brighter days".

"Big Power RZ is an excellent solution for planting at the start of the season, both for the truss variety and the so-called specialities such as cherry, cocktail and mini plum – concluded Mr Asta - whereas Emperador RZ is suitable for the truss type in November plantings, helping to deal with the colder periods from the start, with a great vegetative and productive boost and without changing the variety characteristics of the grafted plant".

Salvatore Asta, OrtoKamarina, Italy

"King Kong RZ is the best solution for my growing conditions"

Greenhouse vegetable growing in the South of Crete Island in Greece started in the late 80's. Main crops are cucumber, tomato, aubergine and pepper. Stauros Petresis is a young grower from Ierapetra, growing beef tomatoes for 6 years in his own greenhouse.

"King Kong RZ has a very strong root system and has a very good cold tolerance which allow me to make a longer cycle"

Two years ago, he started to get problems because of the low quality of the water, especially at the beginning of the crop. The water used is partly coming from a lake collecting the rain, but in that period few water is available and they use also water from the ground. Electrical conductivity before adding fertilizers can be up to 2,6 mS.cm1. Then Stauros Petresis started to graft on King Kong RZ, following the recommendation of his technical adviser. Grafting on this rootstock not only solved his problems regarding salinity, but significantly improved his crop. In the self rooted crop, Mr. Petresis also had problems with soil born diseases like Fusarium.

Using King Kong RZ, he also solved this problem. "King Kong RZ has a very strong root system and has a very good cold tolerance which allow me to make a longer cycle", he says. Consequently it's also giving a better fruit size and more yield. Combination of this rootstock with standard varieties like Despina RZ, Belladona, Daphne or the new variety from Rijk Zwaan 74-675 RZ is very good.

Stauros Petresis, Producer, Greece

Overview R

RECOMENDATIONS: All tomato varieties in long winter cycle, especially cluster tomatoes.

Emperador RZ

"Strength under control"

High production and good balance. Lot of energy to the fruits (bigger size, good quality). Very good and stable behaviour in different conditions and suitable with a lot of tomato varieties. Good cold tolerance. Highest level of nematode resistance.

Resistances

HR: ToMV:0/Fol:0,1/For/Pl/Va/Vd/Ma/Mi/Mj

Recommended combinations

Excellent with cluster and intermediate varieties in South Europe (Razymo RZ - Ramyle RZ - Delyca RZ - Pitenza - Daniela).

Main growing areas

North Europe
South Europe
East Europe
North America

RECOMENDATIONS: Especially for special tomato varieties: cocktail and cherry.

Big Power RZ

"Strongest power"

High production. Very good balance vegetative /generative in autumn. Excellent fruit quality : colour, size, shape, heavy fruit. Very uniform yield during the cycle. Good cold tolerance.

Resistances

HR: ToMV:0/Ff:1-5/Fol:0,1/For/Pl/Va/Vd/Ma/Mi/Mj

Recommended combinations

Very good with all cherry and cocktail varieties (Piccota RZ - Guindo RZ - Tiguan RZ - Shiren - Katalina - Ministar).

Main growing areas

North Europe
South Europe
North America

RECOMENDATIONS: Very good for protected crops and to control the vigour of the plant with 2 stems.

Montezuma RZ

"Generative F3 resistant"

Fusarium 3 resistant variety. High production. High and generative vigour. Very good fruit quality.

Resistances

HR: ToMV/Fol:0-2/For/Pl/Va/Vd/Ma/Mi/Mj

Recommended combinations

Very good compatibility with commercial plum and beef varieties in Mexico.

Main growing areas

North America

Z rootstocks

King Kong RZ

"Best balanced crop"

High production. Very good balance of the crop. Very good fruit setting and fruit quality. Earliness and uniform yield during the cycle. Open plant, less sensitive to fungal diseases. Highest cold tolerance.

Resistances

HR: ToMV:0/Fol:0,1/For/Pl/Va/Vd/Ma/Mi/Mj

Recommended combinations

Very good with beef varieties in short spring cycles (Montenegro RZ - Rioalto RZ - Caramba - Bond), but also in long winter cycles (Dyvine RZ - Valouro RZ - Despina RZ - Isthmia RZ - Calvi - Prystilla - Belladonna).

Main growing areas

South Europe
North Africa
Middle East

RECOMENDATIONS: Vigorous tomato varieties and short cycle. Also for aubergine varieties.

Yedi RZ

"Excellent fruit quality"

High production. Good balanced vigour (vegetative /generative). Nice fruit colour and size. Long and uniform harvest period. Open plant, less sensible to diseases. Good cold tolerance.

Resistances

HR: ToMV:0/Fol:0,1/For/Pl/Va/Vd/Ma/Mi/Mj

Recommended combinations

Excellent with cluster and intermediate varieties in Turkey (74-501 RZ - 74-252 RZ - Azra - Vuslat - Ikram - Petrus).

Main growing areas

South Europe
North Africa
Middle East

RECOMENDATIONS: Vigorous tomato varieties and short cycle. Also for aubergine varieties.

61-071 RZ

"Vigorous F3 resistant"

Fusarium 3 resistant variety. High production. Very good fruit size.

Resistances

HR: ToMV:0/Ff:0,2,4/Fol:0-2/For/Pl/Va/Vd/Ma/Mi/Mj

Recommended combinations

Very good compatibility with varieties like Cid in openfield in Mexico.

Main growing areas

North America

RECOMENDATIONS: Adapted to openfield crops. Good to stimulate the vigour of the plant with 2 stems.

Carlos Ibarra, Production Manager, México:

"Montezuma RZ, the best solution for Fusarium 3 in Sinaloa"

Agrícola El Nazario (González Reyes Group) ▶

Agrícola El Nazario is a farming company in Culiacán, Sinaloa. They mainly produce plum tomatoes in open field and in greenhouses. They also produce slicer cucumbers and jalapeño chili peppers on a smaller scale.

The principal problem they had in the plum tomatoes was Fusarium wilt (Fusarium oxysporum fsp lycopersici race 3), as this fungus race appeared and extended very quickly, and there were no available varieties in the market with the required fruit characteristics.

The company, as others, based first the strategy to solve this problem on the use of chemical products to disinfect the soil, as metam sodium. But this wasn't a medium and long term solution.

Looking for more alternatives to solve the problem, they started to make trials with rootstocks. In the first years there were no commercial rootstocks with resistance against the 3 races of Fusarium, only against 2 of them. But due to the vigour transmitted by the rootstocks to the varieties, the tolerance to the race 3 was increased, allowing to make a long crop.

«Actually they use the rootstocks Montezuma RZ and 61-071 RZ from Rijk Zwaan»

At the same time, they realized that with the use of rootstocks, they didn't get only healthy and strong plants: the average size of the fruits was also increased about 10-20% and the quality was improved as the fruits were better filled and were more uniform. The improvement was not only the resistances, but also quality and production.

4 years after the first trials using rootstocks in tomatoes, the first varieties with resistances to the 3 races of Fusarium appeared in the market. With these new varieties it's now possible to make long crops in open field and in greenhouse. They can grow these tomatoes with a very high yield.

Recently a new problem appeared, a new species of nematodes for which there is no resistance in the current rootstocks: *Meloidogyne mayaguensis*. Until now, it has been possible to manage with metam sodium together with high vigour rootstocks.

Recently a new problem appeared, a new species of nematodes for which there is no resistance in the current rootstocks: Meloidogyne mayaguensis.

During the season 2009-2010 in Agrícola El Nazario they did three plantings of plum tomatoes.

The first consists in 40 ha of indeterminate plum tomatoes (not grafted, but the varieties are resistant to Fol 0-2) and 103 ha of grafted indeterminate plum tomatoes. The density is 14.000 plants per ha on 2 stems. The second planting consists in 96 ha of grafted indeterminate plum tomatoes. The third part is planted in nethouses with 30 ha of grafted indeterminate plum tomatoes in soil and 20 ha in coco substrate. They also manage 40 ha of slicer cucumbers and 45 ha of jalapeño chili peppers.

The company do all the grafting internally. They have their own facilities for the grafting process, it's a pioneer company for this technique in Mexico, especially regarding the quantity of grafted plants. An important point in the selection of the rootstock to be used, apart from its compatibility with the commercial varieties and the influence over the fruits, is the total germination and its uniformity. This is crucial for the choice of the rootstocks in the company.

Actually they use the rootstocks Montezuma RZ and 61-071 RZ from Rijk Zwaan. Both rootstocks have shown a big influence on the fruits, and they have different vigours: they can choose the most suitable according to the vigour needed in each different planting. Apart from the positive influence on plant vigour, each one has a very good generative effect.

The new upcoming root knot nematode

Meloidogyne mayaguensis, also called M. enterolobii, is a relative new upcoming root knot nematode. In the 20th century the occurrence of this nematode was reported only a few times, but from the year 2000 on, its occurrence has been reported several times in Africa, Asia, Middle-east, North- and South America and Europe. Its reproduction cycle is comparable with those of other *Meloidogyne* species. *M. mayaguensis* is a highly virulent nematode of many vegetables. It reproduces on tomato and pepper genotypes which are resistant to *M. incognita, M. javanica* and *M. arenaria*. Other hosts are among others eggplant, cucumber, melon and watermelon.

For Rijk Zwaan it is a real challenge to breed for resistance to this aggressive nematode and find new ways handling with *M. mayaguensis*.

Benjie Nel, South Africa

"King Kong RZ, the most flexible rootstock for difficult African climates"

Benjie Nel at his nursery ▶

Benjie Nel is part of a family that farms on the banks on the Limpopo River, right on the border between South Africa and Zimbabwe. It is remote, dry and very hot in the summer, surrounded by natural bush that is teeming with wildlife. The Nel farm is an oasis of order and industry, delivering a variety of products to some of the biggest supermarkets in South Africa.

«The extra vigour we get from grafting allows us to get a marketable size on the fruit.»

Amongst other crops they grow a range of different tomato types, some on stakes in the open field, and some under plastic or nets. "Our farm has some special challenges, " says Benjie. "Our summers are very hot and long, and our winters are mild and short, but we can also experience periods of heavy frost. We mostly try to deliver in the winter and the spring, using our mild winters to our best advantage. That means our plants have to start growing in intense heat, develop their fruit in temperatures that can be as low as 6 degrees C on average, and then still flower and bear fruit in the spring, when it can very quickly warm up to 40 degrees C. In its life the plant has to be able to adapt to a lot of extreme changes. On top of that we face a very heavy nematode challenge, probably coming from the river water we use. We plant everything in the soil, and while we are not organic farmers we try to do everything as naturally as possible, so having such a heavy nematode pressure is a real headache for us".

Some years ago, Benjie's father realised that the nematode challenge was not going away, and within his vision of a more sustainable farming system he started to investigate the benefits of grafting. "At that time there was no plant raising nursery that was grafting tomato plants in South Africa, so my father decided that we should start our own nursery. He sent me to England to learn the techniques, which I did pretty quickly, but it is one thing to learn the practical technique. It is a completely different thing to be able to consistently graft large numbers of plants with a high success, especially when you only have limited facilities at your disposal and there is very little technical support around you. It took a couple of years, paying what we call 'school fees', for me to be able to give my brother and father enough plants to make semi commercial trials in the field. We quickly found that the benefits were enormous, and we took the decision to graft on a commercial scale. We constructed a grafting facility and a nursery, and trained our team" .

«With my small team it is much easier to learn and manage one rootstock, so we are very happy that King Kong RZ is such a good all-rounder!»

Today Benjie and his team graft several hundred thousand tomato plants for their family farm. Says Benjie: "We graft all our speciality tomatoes that grow under plastic and under nets. We use very specific varieties that give the taste and quality that our clients demand, and these varieties simply could not survive the nematode attack. Now we can manage much longer cycles and get good yields, and we lose fewer plants to nematodes or to secondary infections that follow the nematodes, but our customers are still very happy with the fruit we deliver."

Benjie also grafts all the late season plantings of larger tomatoes that grow in the open field: "These plants have to grow and set in the cold, with very variable temperatures. The extra vigour we get from grafting allows us to get a marketable size on the fruit, and in general our grafted plants seem to have the resilience to do well under our extreme conditions".

Benjie repeats again that they had to pay their 'school fees'. " We tested, sometimes on a large scale, all the tomato rootstocks available in South Africa, with very variable results. I learnt that a successful rootstock must not only be successful in the nursery, it must also match the characteristics of the scions, the combination must do well in the field, and the end product must do well on the shelves. Over the last two years we settled on King Kong RZ as our standard tomato rootstock. Very important for me is that it behaves very well in the nursery. I find it is easy to graft, and I get a high success rate, I think because the grafted plants are hardy and suited to our fluctuating conditions: they don't die!. We grow different types of tomatoes - standard intermediates, large plums, mini plums and cherries, and we find that King Kong RZ is flexible enough to give us a good result on all these types under all our growing conditions, but without losing anything on the taste and quality. With my small team it is much easier to learn and manage one rootstock, so we are very happy that King Kong RZ is such a good all-rounder!"

So Benjie, what's the next challenge? "Well, peppers also get nematodes..." he says with a gleam in his eye.

Agriland, Lebanon

"Yedi RZ, the best against Crown Root Rot"

Agriland team ▶

Lebanon is a small country where only about 248,000 ha are cultivated of which 42% are irrigated and 6% are under greenhouse production. Almost 16 % of the total cultivated area is used for growing vegetables.

Agricultural production is concentrated in the Bekaa followed by the North and South. These three regions hosted the largest area assigned for vegetable production: (Tomato, Cucumber, Watermelon, Squash, Melon, Pepper and Eggplants planted under greenhouses or in open fields). Almost all Watermelon/melon growers (90%) used grafted plants. About 40% of tomato, eggplants and pepper growers switched to grafting, since this technology has shown to be a great success in resisting stressing conditions (cold winter and drought) and rising growth promotion, thus reducing high costs of pesticides and fertilizers.

Yedi RZ showed better tolerance especially against Crown Root Rot disease, which is the reason why 60-70% of the grafted Solanacea varieties in the Lebanese market are grafted on Yedi RZ.

Agriland (the distributor of Rijk Zwaan) started grafting operation in 2002 with a team of twenty workers. The nursery introduced grafting concept following Lebanon's adoption to Montreal Protocol as an alternative to Methyl Bromide. At that Time, Agriland was able to produce about 300 thousands high quality grafted plants. Currently, the nursery is fully equipped with modern technology and highest skills (60 workers operating under the supervision of two agricultural engineers) which guarantee the production of healthy and good quality grafted plants. The capacity was expanded to reach 10 million plants annually. Starting 2010, about 3,250,000 plants will be grafted among which 2,500,000 watermelon plants (60-65% of the Lebanese market) and 750,000 tomato and eggplants (20-25 % of the market share).

Grafting plants is an excellent practice to control the main soil diseases, since Rootstocks help reducing the impact of the following diseases:

-On tomato: Fusarium, Verticillium, Crown Root Rot

- On Watermelon: Fusarium, Verticillium,

- Tolerance to Nematodes is limited by the soil temperatures (inefficient if higher than 30°C which is almost always the case in Lebanon, under greenhouses).

Compared to other rootstocks available in the Lebanese market, Tomato plants grafted on Yedi RZ showed better tolerance especially against Crown Root Rot disease, which is the reason why 60-70% of the grafted Solanacea varieties in the Lebanese market are grafted on Yedi RZ.

Tolerance to diseases is not the only advantage of Grafting: Grafted plants showed earlier maturity, higher production and better fruit quality compared to non-grafted plants. In Lebanon, eggplants are grafted to increase its cold tolerance and have longer producing period.

The success accomplished during these years motivates Agriland to expand its activities and introduce to the Lebanese market more developed cultivation forms and new concepts in agriculture: Organic Farming.

Developments in pepper grafting

52-02 RZ

HR: Mi – IR: Pc

Recommended for winter cycle.

This rootstock showed good results in internal trials.

52-03 RZ

HR: Mi – IR: Pc

Recommended for heating or spring / summer cycles. This rootstock has shown good results in trials in Hungary with the varieties Kurca and Vidre.

Juan Francisco Molina, Spain

"Emperador RZ, the best against nematodes"

Juan Francisco Molina ▶

Juan Francisco is a tomato grower from La Cañada, an important growing area close to Almería in the South of Spain. Before him, his father was growing tomatoes in the same farm since the 70's.

The plants developed normally through the nematode infection and offered a good level of production of Razymo RZ.

He started to have soil problems (mainly Fusarium and nematodes) about 10 years ago. His first reaction was to change to a hydroponic crop, growing on rockwool or other substrate. But the highest costs of this system obliged him to keep a part of the farm in soil.

His experience with grafting started about 6 years ago, mainly to solve the nematode problem. At the beginning, the response of different rootstocks was pretty good but in the last 3 years, the pressure of nematodes was getting worst and the rootstock didn't offer a strong protection any more.

I'm very satisfied with Emperador RZ. Apart from the nematode resistance, it has a very good behaviour with the variety Razymo RZ.

The use of rootstocks is helping the crop to survive to the infection, but the level of resistance is different depending on the planting, the climate and the rootstock variety.

During the last 2 years, he has been testing a lot of different rootstock varieties. "Some plants grafted on the less resistant rootstock were dying from the nematode infection", he says.

"I selected Emperador RZ as the most resistant one. The plants developed normally through the nematode infection and offered a good level of production of Razymo RZ".

Juan Fransisco explains that "I'm very satisfied with Emperador RZ. Apart from the nematode resistance, it has a very good behaviour with the variety Razymo RZ. The combination is very good. It gives a well balanced plant, not too vigorous, with a good production in fruit size and fruit quality".

HR: ToMV:0/Fol:0,1/For/Pl/Va/Vd/Ma/Mi/Mj

61-073 RZ, new rootstock variety for aubergine grafting

61-073 RZ is an interspecific rootstock that has been selected specially for aubergine grafting purpose. The results of two years trials in several Mediterranean countries show a good combination with the aubergine varieties and an extra vigour compared to the other rootstocks. The trials have been performed in Spain, Greece, Italy and Turkey with varieties like Monarca RZ, Thelma RZ, Brigitte RZ, Anatolia RZ.

It shows a very generative vigour with a good cold tolerance and is consequently adapted to winter cycles in Southern Europe.

RZ Specialists

Alessandro Silvestrelli
+39 335 62 45 797
a.silvestrelli@rijkzwaan.it

Rafik Jaadouni
+212 661 382 607
r.jaadouni@rijkzwaan.ma

Ruud van Holsteyn
+31 653 366 047
r.van.holsteyn@rijkzwaan.nl

David Herzog
+34 661 226 350
d.herzog@rijkzwaan.es

Gert-Jan Krook
+31 610 781 223
g.j.krook@rijkzwaan.nl

Marcus Burnett
+27 (0) 83 631 4298
m.burnett@rijkzwaan.co.za

Abdullah Sa'Sa
+962 795 654 441
a.sasa@rijkzwaan.com

Argun Sahin
+90 533 296 9634
a.sahin@rijkzwaan.com.tr

Resistance codes

Lycopersicon esculentum **(Tomato)**

Scientific name	English common name	Spanish common name	Code
Fungi:			
Alternaria alternata f.sp. *lycopersici*	Alternaria stem canker	Alternaria	Aal
Alternaria solani	Early blight	Tizón temprano del tomate, Alternariosis del tomate	As
Corynespora cassiicola	Target spot	Mancha foliar	Cc
Fulvia fulva (ex *Cladosporium fulvum*)	Leaf mold	Cladosporium	Ff (ex Cf)
Fusarium oxysporum f.sp. *lycopersici*	Fusarium wilt	Fusarium	Fol
Fusarium oxysporum f.sp. *radicis-lycopersici*	Fusarium crown and root rot	Fusarium	For
Leveillula taurica (anamorph: *Oidiopsis sicula*)	Powdery mildew	Oidio	Lt
Oidium neolycopersici (ex *Oidium lycopersicum*)	Powdery mildew	Oidio	On (ex Ol)
Phytophthora infestans	Late blight	Mildiu	Pi
Phytophthora parasitica	Buckeye fruit and root rot		Pp
Pyrenochaeta lycopersici	Corky root rot		Pl
Stemphylium botryosum f.sp. *lycopersici*	Gray leaf spot	Mancha gris de la hoja de tomate	Sbl
Stemphylium lycopersici	Gray leaf spot	Mancha gris de la hoja de tomate	Sl
Stemphylium solani	Gray leaf spot	Mancha gris de la hoja de tomate	Ss
Verticillium albo-atrum	Verticillium wilt	Verticillium	Va
Verticillium dahliae	Verticillium wilt	Verticillium	Vd
Nematodes:			
Meloidogyne arenaria	Root-knot	Nemátodos	Ma
Meloidogyne incognita	Root-knot	Nemátodos	Mi
Meloidogyne javanica	Root-knot	Nemátodos	Mj