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Focus on Cyperus esculentus.

In recent decades several new pests, disease and weeds have been imported into Europe and are deeply affecting our agriculture. The estimated damage from invasive species worldwide is more than 1.4 trillion USD per year, meaning 5% of the global economy (Pimentel et al., 2001). Insects like Halyomorpha halys or Popilia japonica are spreading through different regions, while bacteria Xylella fastidiosa is threatening the European olive industry after seriously damaging olive trees in southern Italy. Especially in horticultural crops, different nematodes may be included in this list, like Ditylenchus dipsaci, Meloidogyne chitwoodi, Globodera rostochiensis, etc. To monitor this trend, specific lists of quarantine organisms have been released and continuously revised. Among these, weeds have also been taken into account, like Cyperus esculentus, or Yellow Nutgrass. Characterised by the uniqueness of the triangular shaft of their stems, these weeds are monocotyledonous plants, both annual and perennial, spreading into the environment especially through their rhizomatous roots. They can affect many different crops, becoming a severe issue in vegetables in general, corn, rice and even orchards, according to the species. Therefore EPPO has included them in its list of “Invasive alien plants” since 2004. Yellow Nutgrass is the tallest member of this family and may reach a height of one metre. These weeds have presumably dispersed from North Africa, spreading slowly through Asia, Europe and even the Americas, with the complicity of global trade. In Western Europe they have occurred in Germany, Holland, Belgium, France, Spain, Portugal, Italy and Austria, and have been spotted also in several areas in the Balkans, Greece, Turkey and Eastern Europe (Fig. 1). In these environments they may complete their biological cycle from mid-April to September. It is not easy to control them, due to their progressive germination from tubers and the extremely thick lattice of rhizomes they produce through the soil. Due to the importance of this alien invasive plant, Certis Europe decided to dedicate a special number of CleanStart News to focus on its distribution, crop damage and management, involving several European researchers, experts and technicians to share their experience inside our forum.
FOCUS ON CYPERUS ISSUE: EUROPEAN PERSPECTIVE.

Strategy against Sedge family (Cyperaceae). A search for tools of adaptable weed control in vegetable crops in France.

Created in 1973, Sileban, acronym of Société d'Investissement Légumière et maraîchère de Basse Normandie, is an experimental station for the development of vegetable crops in Lower Normandy (France) and represents the technical support for the regional vegetable supply chain. Their work and studies contribute to the competitiveness of vegetable farms, to the quality of vegetables and to sustainable development of the production of this area. Heavily involved in innovative technical and environmental processes, Sileban has developed several collaborations in France and abroad.

Concerning Nutsedge, Cyperus esculentus, Sileban has sound experience in the French environment. Propagation of Nutsedge seems to be correlated to crop type and agronomical rotation. The use of agricultural machines also plays a dominant role in dispersion of tubers. Tumbleson and Kommedahl (1961) reported that in one single year a tuber is able to create a surface area of 2 metres diameter containing 1,900 plants and almost 7,000 tubers. This impressive infestation will generate strong competition for light, water and the nutrients of the soil. Since 2010 Sileban focused on different approaches aiming to improve control strategies against Nutsedge by evaluating various means of control on the principal vegetables cultivated regionally, such as carrot and leek.

A mechanical approach includes the use of a harvester removing Cyperus tubers from the soil. Unfortunately this practice leads to the retention of a maximum of 80% of tubers present in the sieved soil profile, to a depth of 10 cm. The capacity of emergence of the tubers from deep soil profiles (35 to 40 cm) as well as the number of tubers remaining after sieving leads to a high potential of recontamination.

An agronomic approach includes the battle against seed stock in the medium and long term. This strategy has the advantage of introducing new and more competitive crops.

Last but not least, there is also a phytosanitary approach, based on herbicides and/or soil fumigants. Unfortunately, few chemical families can sustainably control the sedge family including C. esculentus, like chloroacetamides, in pre-emergence and some sulfonylureas in post-emergence. In any case, their efficacy is often partial and not durable, due to the large proportion of tubers which seem to retain a capacity for emergence or re-emergence.

We must also not forget the lack of selectivity on several crops. Residue risk is therefore an important difficulty in finding adaptable herbicide solutions.

Fumigants are found to be suitable to control C. esculentus due to their activity not only on nematodes or telluric pests, but also on weeds: products like metam sodium, dazomet or the new DMDS, or dimethyl disulfide. This last product has a gaseous nature and it means that it can move within the profile, reaching a large volume of soil. Its incorporation or deep injection into the soil may therefore also act on the more superficial tubers as well as on the deepest ones. Moreover, plastic films maintain the active ingredient in the treated zone for a longer time, increasing efficacy. Due to its selectivity to crops, after uncovering and aeration of the soil, this may be cultivated with no risk of phytotoxicity, without any need to change rotation or any problem concerning residue. (read more)

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FOCUS ON CYPERUS ISSUE:
NORTH AMERICA PERSPECTIVE.

Management of Purple and Yellow Nutsedge (Cyperus spp.) in Florida.

According to various official evidence, Cyperaceae are not only an issue for Europe, but also for other continents, the Americas as well. For this reason Certis has invited the US researchers Josh Freeman and Peter J. Dittmar, from the University of Florida, to present their experience in controlling this difficult weed in their country.

Purple and yellow nutsedge, Cyperus rotundus and C. esculentus respectively, also reached the USA, presumably through global trade of vegetable material.

They spread very quickly through America, becoming a huge issue for many farmers. Vigorous and invasive, they have been able to adapt to different climate and soil conditions, affecting several types of crops. C. rotundus especially shows a strong rhizomatous behaviour, producing long chain rhizome structures, and machinery may also be a good ally of these weeds, because they spread and multiply rhizomes during soil finishing procedures. Only heavy tillage may be useful to control them, but it is expensive and contradicts modern guidelines, which suggest minimising soil tillage due to environmental concerns, namely emission of carbon dioxide caused by high volumes of fuel consumption. For its part, due to its erect and sharp leaves, Cyperus esculentus may even cut plastic mulch, as well as intruding through holes made in plastic films ready to transplant the crop.

According to the University of Florida, Horticultural Sciences Department, a yield loss of around 10% has been recorded in pepper fields facing an infestation of only five C. esculentum plants per square metre. Even worse news about C. rotundus, which is able to cause a loss of 44% in tomato yield with a density of 200 plants per square metre.

As a matter of fact, its dimensions are smaller compared to C. esculentum so a higher number of specimens per square meter is needed to produce similar damage. This higher number of plants is easily reached due to its great potential to spread through rhizome fragmentation. In the past, apart from pre and post-emergence herbicide, suitable in open field only, the most effective way to control Cyperus spp. in horticulture was soil fumigants, such as methyl bromide, but these have been affected by severe regulatory restrictions. Nowadays, in Florida the two weeds are controlled using fumigants like 1,3-dichloropropene, chloropicrin, metam sodium and dimethyl disulfide (DMDS), often used in combinations to broaden the pest control spectrum. Some of these fumigants cannot be used in Europe, due to their non-inclusion in Annex I, like chloropicrin and 1,3-dichloropropene. For the latter active ingredient some derogations have been granted in Italy during 2015 and 2016, due to agronomical emergency caused by nematodes in horticultural crops.
Dutch experience

Nut grass (*Cyperus esculentus*) is a very difficult to control perennial plant. The fast vegetative multiplication, by forming small bulbs, causes an enormous annual increase of the nut grass population. One of its impacts is the prohibition of cultivation: only when no nut grass is found for three consecutive years can farmers grow other crops again in those fields. However, since 2009, farmers can request an exemption to grow maize if the location was free of nut grass at the last inspection. Some herbicides may be used, but they control emerged nut grass only and not tubers. Therefore, as well as herbicides, soil fumigants must be used. In the past metam sodium provided excellent control at a rate of 700 L/ha, using products with 510 g/L of a.i. (e.g. Monam), but since 2015 this rate has been limited to 300 L/ha, which is insufficient for nut grass control. Now there is a new product with the name, Accolade, containing 163 g/L of dimethyl-disulphide (DMDS). Some field trials developed in the Netherlands with Accolade provided excellent control against nut grass (*Cyperus esculentus*). In 2016 Accolade was applied in comparison with metam sodium. Both plots were tarped with TIF-plastic (Total Impermeable Film) directly after treatment and both products were applied according to Good Agricultural Practices.

Before treatment a huge average of 36 nut grass plants were counted per m². The application took place on 2 June 2016, when nut grass was at a maximum 4 leaf stage (length max 10cm), where tubers are very susceptible to soil fumigant products. Accolade was injected at a depth of 25 cm. Metam sodium was applied at a depth of 18 cm and incorporated in the 25 cm layer, and with the help of the spading machine. Plastics were removed from the plots on 4 July 2016 (32 days after treatment). Efficacy was assessed monthly. Below results are presented of the final assessment on 23 September 2016 (113 days after treatment).

All fumigant applications show significant reduction of nut grass. Accolade, at a rate of 380 L/ha (400 Kg/ha a.i.) showed only 0.7% of groundcover (99.2% efficacy), significantly better than Monam at 300 L/ha (153 Kg/ha a.i.) with a groundcover of 12% (77% of efficacy). DMDS 380 L/ha alone or in combination with Metham Na, performs at the highest level. DMDS ensures excellent nut grass control, significantly better than Metham Na alone.
Italian experiences

Nut grass (Cyperus esculentus) quickly became a huge issue in several Italian areas, namely due to poor fumigant choice and dose rate restriction. Some herbicides provide a certain control only in the upper soil layer, providing insufficient efficacy on rhizomes. The Maccarese area, in Lazio Region, close to Rome, is the most important one for carrot production and Accolade AL has been tested for two years giving excellent control of this weed.

Two years of success in trials

During 2015 and 2016 Accolade AL (DMDS, dimethyl-disulphide, 1063 g/L) was applied against nut grass at different rates, alone or in co-application with Metham Na, in comparison with the official standard. Two trials were carried out on carrot in highly infested Maccarese areas. Accolade AL and the standard fumigant reference were applied at the beginning of June in very sandy soil with a shank applicator. Fumigants were injected at a depth around 25 cm in a soil at 50% of field water capability. Treated plots were covered with Total Impermeable Film (TIF). Accolade and Accolade plus Metham Na were applied at the same time, using rates of 300, 400 and 400+170 kg a.i./ha respectively. The plastic film was removed 14 days after application and efficacy assessments on nut grass control were carried out 90 days after treatment. Nut grass control data are expressed both as a percentage of ground covered by Cyperus and as efficacy (%).

In 2015 a cover of 70% in the untreated control was measured, while the standard reference showed a value of 60% only. Plots treated with Certis products showed respectively 15, 6.3 and 10% respectively. Accolade AL alone at dose rate of 400 kg a.i./ha achieved the highest efficacy level (90%), better than DMDS & Metham (85%) and DMDS low dose rate (80%). In 2016 the protocol has been changed, using Metham Na as standard reference in comparison with Accolade AL applied alone (400 Kg/ha) or in co-application with Metham Na (400+170 Kg/ha). The untreated control showed a coverage of 33.8% with nut grass, while DMDS, alone or in combination with Metham Na, showed values of 2.5 and 1.8% respectively, significantly lower compared to Metham Na alone (8%). This gives percentage of control of 97% for DMDS plus Metham Na combination and 95.8% for DMDS alone. Both DMDS treatments ensured efficacy significantly higher than Metham Na (80%).

Conclusion

All fumigant applications guarantee significant reduction of nut grass infestation. Nonetheless, DMDS 400 kg a.i., straight, alone or in combination with Metham Na, performs at the highest level. DMDS ensures excellent nut grass control, significantly better than Metham Na alone.
Yellow nutsedge (Cyperus esculentus) is a plant belonging to the Cyperaceae family and is becoming a huge issue, especially in Italian cultivated areas characterised by a hot-dry climate. This weed shows a high invasive capacity and persistence of tubercles in the soil makes it particularly difficult to control both with chemicals and different agronomic tools. For some horticultural or industrial crops, both in open field and greenhouse, Yellow nutsedge is a real emergency for it is able to cause severe damage to crops. In the Fiumicino agricultural area, a few kilometres from Rome, its presence quickly became a real disaster for farmers. Specifically to further investigate this issue and to check for possible solutions, Certis Europe interviewed Dr. Tiziano Biancari, one of the most expert technical authorities for the area.

Q. Dr. Biancari, could you briefly describe the Fiumicino agricultural area, where you have been operating from more than 15 years?
A. The Fiumicino area is very large and includes horticultural crop production in Maccarese. We can consider an area of approximately 1,000 ha, cultivated with high-value crops such as carrot, potato and other vegetables in open field. In particular carrots are a real speciality in Maccarese. The combination of sandy soil and climate allows the best development conditions for cultivation of carrots, carried out on about 500-600 has, used for a double-crop/year cycle. From its side, potato production is also rapidly expanding and its cultivation is estimated on 150 ha. The remaining area is planted with spring cycle and autumn salads, with melon, watermelon, tomatoes, peppers and other vegetable crops in spring and summer cycle, as well as fennel cycle in autumn-winter.

Q. What is the magnitude of infestation with Cyperus and which crops, among those listed, suffer most?
A. Infestation of Cyperus showed an exponential growth in the last ten years, in particular since the use of methyl bromide was no longer possible. Nowadays Cyperus is considered the most important issue after knot and cyst nematodes. More or less all crops suffer damage but it is especially worth mentioning for spring-summer crops that overlap with the maximum development period for this infesting grass. Against these crops Cyperus shows a significant competitive capacity and its sprouts, during the emergence phase, are able to cause damage by penetrating potato tubers or fruit in melon, making their production unmarketable. Even plastic mulch may be damaged by this weed. On carrot it causes major damage due to strong vegetative competition, except for crops grown in the winter period, during which Cyperus is in quiescence.

Q. Please, could you quantify the damage that Cyperus infestations are able to produce?
A. For most sensitive crops the loss of production can be considerable, due to the reduction of vegetative growth and to damage coming from penetration caused by Cyperus. If no action is taken to contain infestation, losses may be total. In case of widespread infestation, if farmers cannot bear the costs of control tools, fields have to be abandoned, at least temporarily.

Q. Which control strategies are implemented by farmers for this issue and what are their limits, if any?
A. Different strategies are available, due to the availability of registered herbicides. However, no one single option is able alone to ensure a sufficient level of efficacy. This is linked on one hand to the very short sequence of crop cycles that follow one another without a break and, on the other hand, to the remarkable persistence in the soil of Cyperus infestation: one single plant coming from a tuber is able to produce nearly 2,000 shoots and up to 7,000 tubercles. Moreover soil texture, mainly sandy, can impede the cultivation of other crops, such as corn, which could allow easier control thanks to a wider availability of effective herbicides. Therefore it is quite common to use soil fumigants during summer, with the aim of reducing the Cyperus infestation level. For instance, farmers may apply fumigants so called “isothiocyanates generators”, like Metham Na, Metham K and Dazomet, but their current limitations of use, with one application only every three years, or dose, reduce the effectiveness of these strategies. Metham Na, as an example, may be used in open field at a maximum dose of 340 L/ha. Another strategy, where field conditions allow, includes repeated applications of glyphosate before planting crops. Following this approach it is possible to devitalise as many plants as possible and prevent subsequent weed emergence during cultivation. On carrot linuron may be used in post-emergence application, but it is only able to limit Cyperus development,
without ensuring full control. Concerning other crops, unfortunately, only manual eradication is feasible, facing very high costs in terms of labour. This operation makes cultivation unsustainable from a profitability perspective. Only in those fields where infestation is still very low, the farmer may follow this manual approach, acting promptly at the very first evidence of infestation. Also some control attempts using soil solarisation, during summer, gave negative results. After a first partial devitalisation of surface tubercles, in the subsequent stages Cyperus emergence happens anyway, even more pronounced and devastating, due to the high vitality of deep tubercles not knocked-down by the action of heat. Currently, there are no solutions for complete Cyperus control and, in the absence of significant new developments, within a few years the agricultural and productive process in this area could change substantially.

Q. Were you able to test the effectiveness of Accolade (p.a. Dimethyl disulfide) against Cyperus?
A. I followed directly some trials, even on a large area, in this region. The product showed remarkable effectiveness and provided a strong containment of the weed over a long period, thanks to good devitalisation of tubercles. We must also remember that dimethyl disulfide is associated with efficacy on Cyperus and also has a strong herbicidal, nematicidal and fungicidal activity. This product has a high potential, as it showed during field trials. Now we are waiting to see it also in wider applications.
As in other Mediterranean countries, the Baby leaf market is a strategic niche market in Spain too. Unfortunately, protection from soil disease has always been a huge issue. Some attempts were made by Certis Spain to use Basamid Granulat (dazomet, 99%) to disinfect soil adequately, but with no homogeneous and constant result. Three main reasons were found for this discontinuous efficacy. First, at machinery level: several problems were indeed registered in controlling rate distribution. This leads to a lack of homogeneity of Basamid granules into the soil profile. Secondly, bad soil management in the pre-disinfection stage, which could have arisen from a lack of soil humidity, bad soil tillage, improper use of manure and poor weed seeds pre-germination. Especially this last point is very critical for Basamid treatment. Last but not least, a poor sealing system after Basamid application, insufficient to guarantee retention of dazomet gases in the soil.

To ensure the right approach for Basamid application, Certis Europe developed a “tailor made” one pass machine in collaboration with Roter Italia (Forigo) and signed an agreement with Universidad Politécnica de Valencia (Dept. of Rural Engineering and food industry) in order to gain further advantage from a scientific and technical perspective. No less important was the dialogue with producers, directly to meet and understand their practical needs.

Results with this specific kind of machine have been impressive, since this innovative system is able to apply, incorporate, shape the beds and guarantee a perfect seal with plastic film in one single pass. Furthermore, to ensure the best performance, this machine has been managed by a professional applicator and all applications have been supervised by Certis disinfection stewards, who monitored each step of the process, sharing with producers a final results report to be used as a baseline for approaching subsequent campaigns.
A SUCCESSFUL DEROGATION CAMPAIGN 2016 FOR ACCOLADE 94EC (DMDS) IN SPAIN AND ITALY

Good ideas win, always. That’s why in 2016, compared to 2015, Accolade 94EC increased the crops covered by derogation, as well as extending the derogation period. As a matter of fact, due to the huge damages caused by root-knot nematodes, the need for emergency use is growing. Italy and Spain are sound case histories that bear witness to the benefits that Accolade 94EC can bring to the growers. In Italy derogation features increased considerably: indeed, the Accolade 94EC derogation interval is extended from 120 to 180 days, adding also key crops such as tomato, lettuce and melon to the 2015 label, which included only pepper, eggplant, cucumber and zucchini (only protected crops). As a consequence, treated hectares and the number of contractors involved has also increased. Great success has been reported especially in Sicily, one of the most strategic areas in Italy concerning protected crops, where 130 applications have been performed, obtaining a very high level of satisfaction at user level.

In Spain Accolade 94EC was authorised for application in the Murcia region in the tomato crop; close cooperation took place between Certis Europe and IMIDA (local official), covering training of the applicators’ teams, the testing of IPM protocols, the collection of agronomic and yield data. The product has been applied both in net structures and greenhouses and each application has been followed by a project coordinator from IMIDA, a stewardship specialist from Certis and one team of professional applicators. Results and evaluation have been reported farm by farm, by IMIDA and Certis together, recording a very high efficacy in root gall control in all treated farms. This sets an extremely positive expectation for a further request for authorisation in 2017.

Overall a total of 350 commercial applications have been carried out so far in 2015 and 2016 campaigns; we can proudly say that from both the stewardship and efficacy standpoints the percentage of success is extremely high. The extensive use of the specifically developed DAF gas tight film and implementation of best practices, showed great results in managing the odour and appreciation from growers and distribution partners.

In a large number of applications the CleanStart programme has been implemented, combining Accolade 94EC with soil solarisation, with rootstock, with Tusal biofungicide and post-planting nematicides in order to demonstrate to the farmers the efficacy of these sustainable solutions.

The successful derogation campaigns represent a valuable input for our company, in terms of grower feedback and satisfaction, learning on stewardship practices and fine tuning the technical positioning. All these learnings suggest that in 2017 we should be ready for a growing interest in Accolade 94EC, to meet the increasing market demand, born of the great results shown in 2016 and 2015. Certis Europe is extremely proud of this and will strengthen further its Best Management Practice guideline, already developed and shared with officials and users. Moreover, with increasing use of Accolade 94EC, we will also consolidate the training programme for professional applicators, as well as investing to increase the fit of several machines with our product, in a way that will increase application effectiveness and minimise losses. Accolade 94EC technical and market development will also benefit from the depth of knowledge that Certis Europe has acquired about soil treatment: the new solution comes into an already strong CleanStart portfolio, including Basamid, DD Soil, Jet 5, and Tusal, a new soil biofungicide.
15th anniversary for Certis Europe

2016 has been extremely rich with good news coming from Certis Europe, starting right from its 15th anniversary. Fifteen candles were blown out in Scheveningen, in the Netherlands, by Mark Waltham, Chief Executive Officer of the company, celebrating the 15th year from the launch of Certis Europe. As a welcome gift for shareholder representatives from MASI, Kumiai and Nippon Soda, the premiere of “We are Certis!”, the new corporate video, was projected. Then, Mark Waltham highlighted the strong prospects of further growth for the Company, expecting to enrich its current portfolio by 40% with new molecules coming from Japanese research in the next 10 years. The 15th birthday of Certis Europe also included a session focused on team building, bringing together all participants through two creative sessions. The first session called for the construction of coloured kites. Four different teams had to build individual parts of the whole Certis Europe Kite, writing their own message on the modules: a symbolic way to aggregate different skills and attitudes having the same objective. The second session stimulated the most creative part of all participants, divided into two different groups, one called to choose a song, and the other to create a dance, without knowing which kind of song would be chosen. The best way to be prepared to face an unknown scenario.

Agrow Award 2016 for Mark Waltham, Certis CEO

Mark Waltham was announced winner of the award for Best Manager with strategic vision at the ceremony for the prestigious Agrow Awards 2016, held in London. Many reasons for this prize: first, the achievement of a major strategic goal enabling the extension of Certis Europe’s market presence through the creation of a Joint Venture company, KNE Certis, with long-term partner, K&N Efthymiadis, based in Greece. The award also acknowledged changes to the internal structure in Certis Europe and the creation of Portfolio Teams to provide renewed focus on major crop groups, utilising to best advantage the vast experience and expertise existing across the company. Certis Europe deserved this recognition as well, due to success in launching new products, opening new roads into new markets and consolidating performance in the existing ones. In only 15 years the company has been able to grow constantly both in trade and development, becoming a landmark for all technicians, dealers and farmers who were looking for effective products and technical support. Certis Europe invested strongly also at regulatory level, to protect and preserve its portfolio of speciality products. As a matter of fact, sustainability was also included among gulatory issues and Certis Europe took this point very seriously into account too.
Joint Venture between Certis Europe and K&N Efthymiadis

Good partners to grow better. A joint venture has therefore been created between Certis Europe and the Greek company, K&N Efthymiadis. Named KNE Certis, it will merge different experience, expertise and resources of the two companies, in a way that will boost all processes concerning development, registration, marketing and distribution of crop protection products in South Eastern Europe. KNE Certis will operate in Bulgaria, Romania, Moldova, Albania, Cyprus and all countries of the former Yugoslavia. At the beginning Certis Europe will hold 30% of shares, but is looking forward to increasing soon its presence in the new company. Certis Europe and K&N Efthymiadis have collaborated together for more than 15 years, so both companies are pleased to enter into this new phase of their relationship.

K&N Efthymiadis S.A. has a long history in agriculture, having been founded in 1935. Now it is the largest company in the Efthymiadis Group, which includes 10 subsidiaries in Greece and the Balkans, fully dedicated to production, Research & Development and services for agriculture, namely agricultural inputs, plant propagation material, services and food.

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