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Aspects regarding the dynamics of pests found in forest nurseries in North-East of Moldova during 2009-2011

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Abstract This research refers to the dynamics of pest species found in forest nurseries of the Forest Directorates Botosani, Iasi and Suceava during 2009-2011 and it is a part of an extensive research in this area. Research results show that biotic pests represent the largest percentage of harmful factors, i.e. 93.81% and from these 72.60% are insects compared with plant parasites (19.81%) and harmful mammals (7.59%). The most dangerous pests for saplings from the forest nurseries are root insects (87.20% of all harmful insects), out of which the largest share (70.87%) is Melolontha melolontha Larvae, followed by species of Elateridae with 13,20%. In practice, there are detected and predicted all kinds of insect pests, but the focus is on insects which attack the root of saplings in nurseries because the damages caused by them are significantly higher. The intensity of larvae beetles during the years studied has generally been ranked from low (43.02%) to medium (24.58%), only in certain areas the intensity was high (24.74%) or very high(7,66%). For the application of modern prevention methods and pest control is absolutely necessary to permanently know and monitor them. This will ultimately lead to the production of healthy and vigorous forest material ensuring the performance of the afforestation work quality.

Key words

pest, forest nurseries, root insects, saplings

The actual situation of the national standing crop shows that Romania, with a percentage consisting of only 27%, is situated below the European Union average concerning the wooded surface. This fact has become serious, and the real solution to this issue is the accomplishment of a conjunct strategy in order to induce wooded surface rising, whether it is about afforestation of degraded areas, of poor productive plough lands or re-afforestation. This fact must go with the growth of the woodland saplings production and with the quality growth of the actions performed in forest nurseries, because the production of healthy and strong wooded material which can assure quality afforestation actions is indispensable. Presently, ROMSILVA National Administration of Forests produces most of the forest sapplings in its nurseries and therefore, in the present paper there have been analyzed and compared data gathered from them.

It is very important to know the pests which lead to falling saplings production or their quality diminution. The present paper is just a part of a research concerning the forest nurseries pests and young plantations from North-East of Moldavia and it shows results concerning the dynamics of the pests found in the forest nurseries inside Botosani, Iasi and Suceava Forest Directorates within 2009-2011.

Material and Method

The research analyzed the dynamics of the species of pests found in the nurseries in the Forest Directorates of Botosani, Iasi and Suceava within 2009-2011, and also the applied preventing and controlling methods. Inside the Botosani Forest Directorate it was gathered and analyzed some data about pests species found in nurseries inside 6 forest districts with a total area of approx. 32 ha and with the annual medium surface infested of approx. 28.98 ha. From Iasi Forest Directorate was gathered and analyzed information about the species of pests from the nurseries inside 8 forest districts with a total area of approx. 50 ha. The annual medium surface which was infested was of approx. 47 ha and for the Suceava Forest Directorate it was gathered and analyzed information about pests species from the nurseries inside 25 forest districts with an annual infested area of approx. 114.30 ha from a total area of approx. 106 ha. These documentations were elaborated based on tracing and prognosis studies made by the forest districts and county administrations supported by data offered by IACS laboratories, according the methods specific to the ROMSILVA National Administration of Forests. The data were analyzed according to the infested area and according to the intensity of the pests

attack. The processing and centralization of data was performed using Excel (Microsoft Office 2007) and Statistics (StatSoft).

Results and Discussions

Within 2009-2011, the Forest Directorates of Botosani, Iasi and Suceava have produced saplings in their own forest nurseries which equaled an area of over 180 hectares, the largest area was owned by Suceava Forest Directorate with approximately 106 ha, followed by Iasi Forest Directorate with approximately 50 hectares and Botosani Forest Directorate with over 30 hectares.

In more than 90% of the total surface, there were registered pest factors which caused significant damage, but they were largely kept under control by applied preventive and control measures. Regarding the nature of damage, the results of the research indicate the majority participation of the biotic pests with 90,94% in relation to the abiotic ones with 9.06%, their action depends largely on the composition of diverse nurseries (coniferous, deciduous) as well as the development and intensity of climatic factors differently for each forest directorates.

Among the biotic pests, on medium, the insects represent 65.17%, the vegetal parasites 17.67% and the harmful mammals 8,28%. The harmful insects had the highest proportion in Suceava Forest Directorate (74.28%) and lowest in the Forest Directorate Botosani (53.69%), according to figure 1, figure 2 and figure 3.

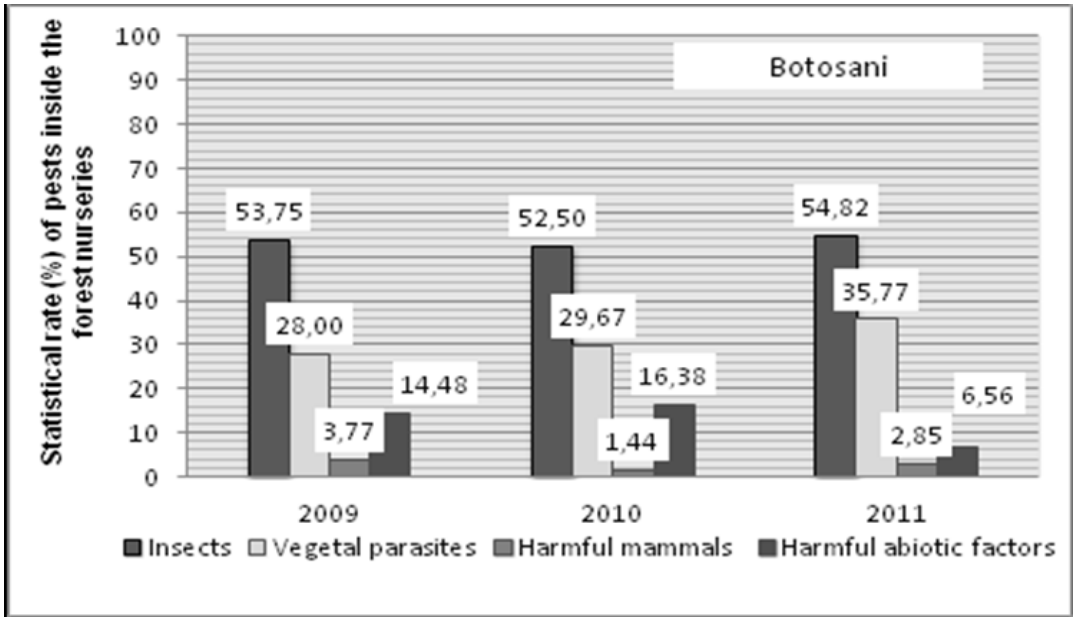

Fig 1. The pests' dynamic inside Botosani Forest Directorate in the period 2009-2011

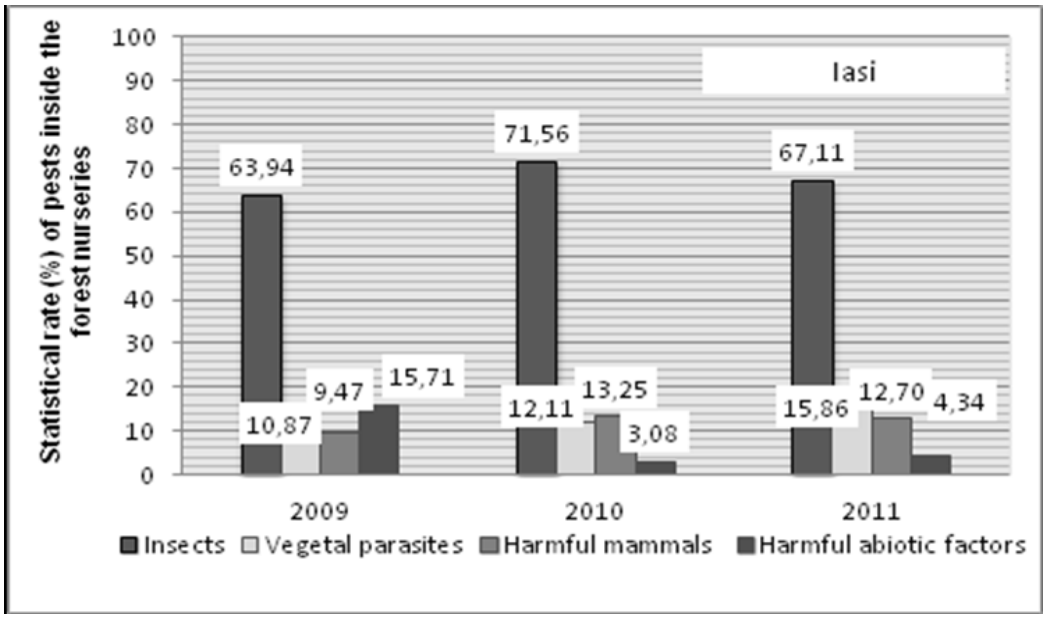

Fig. 2. The pests' dynamic inside Iasi Forest Directorate in the period 2009-2011

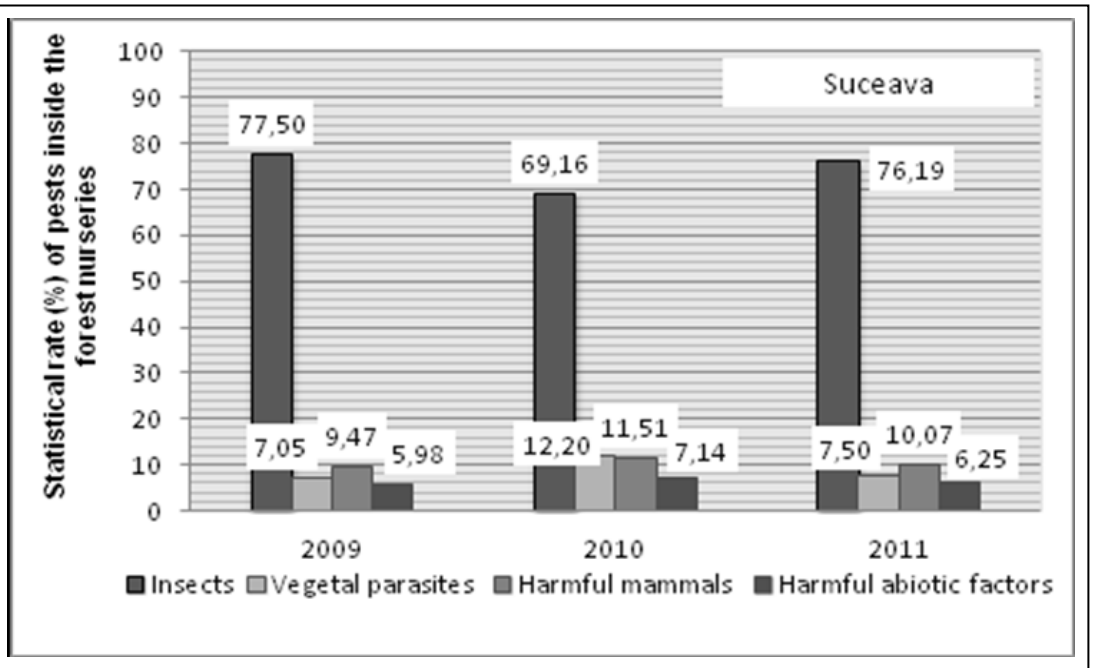

Fig. 3. The pests' dynamic inside Suceava Forest Directorate in the period 2009-2011

The abiotic pests (frost, snow, drought, hail stones, cloudbursts and floods) have represented the lowest pith as affected area, indicating 9,06% at an average of the affected surfaces amount by the harmful factors, the highest percentage being registered in 2010 at the Botosani Forest Directorate (16,38%) when there were registered floods on a surface of 349 ares, and the lowest same in 2010 in Iasi Forest Directorate (3,08%).

Having the most important pith among harmful agents, the insects (65,17%) were meticulously analyzed, according to the attack's place, species, attack's intensity and the affected surface.

The harmful insects detected in the nurseries inside the 3 forest administrations were classified after the nature of their attack insects that attack the root: *Melolontha melolontha* – cockchafer larvas; *Agriotes spp. Elateridae* family – wireworms; *Gryllotalpa gryllotalpa* – mole cricket; insects that attack the stem: *Cryptorrhynchus lapathi* – poplar and willow's moth; *Paranthrene tabaniformis; Otirrhynchus sp.;* defoliating insects: *Hyphantria cunea, Earias chlorana, Melolontha melolontha* – beetles, *Melasoma populi,* mites, *Trips fuscipennis, Stereonychus fraxini* – ash leaves weevil; sucking insects: *Aphrophora, Caliroa spp., Cameraria ohridella.*

Detected vegetal pests (18.59%) are root vegetal pests: *Fusarium sp.,Pytium, Phytophora;* stem, sprout and branch vegetal pests: *Botrytis cinerea;* leaves vegetal pests: *Microsphaera abbreviate, Rhythysima a., Lophodermium sp., Cocomyces hiemalis, Guignardia spp.*

The harmful mammals are mostly represented by *Talpa europaea*- the mole, *Lepus europaeus* – the hare, *Spalax microphtalmus istricus* and *Apodemus sp.* – mice and represent the smallest rate of harm of 7.12% among the harmful factors in the forest nurseries.

The examination concerning the place of attack, indicates the fact that upon an average for Botosani, Iasi and Suceava Forest Directorates in the last 3 years, the highest pith belongs to insects which attack the root's saplings (over 85%), followed by defoliating, sucking insects and those who attack the saplings' stem the forest nurseries *(fig.4).*

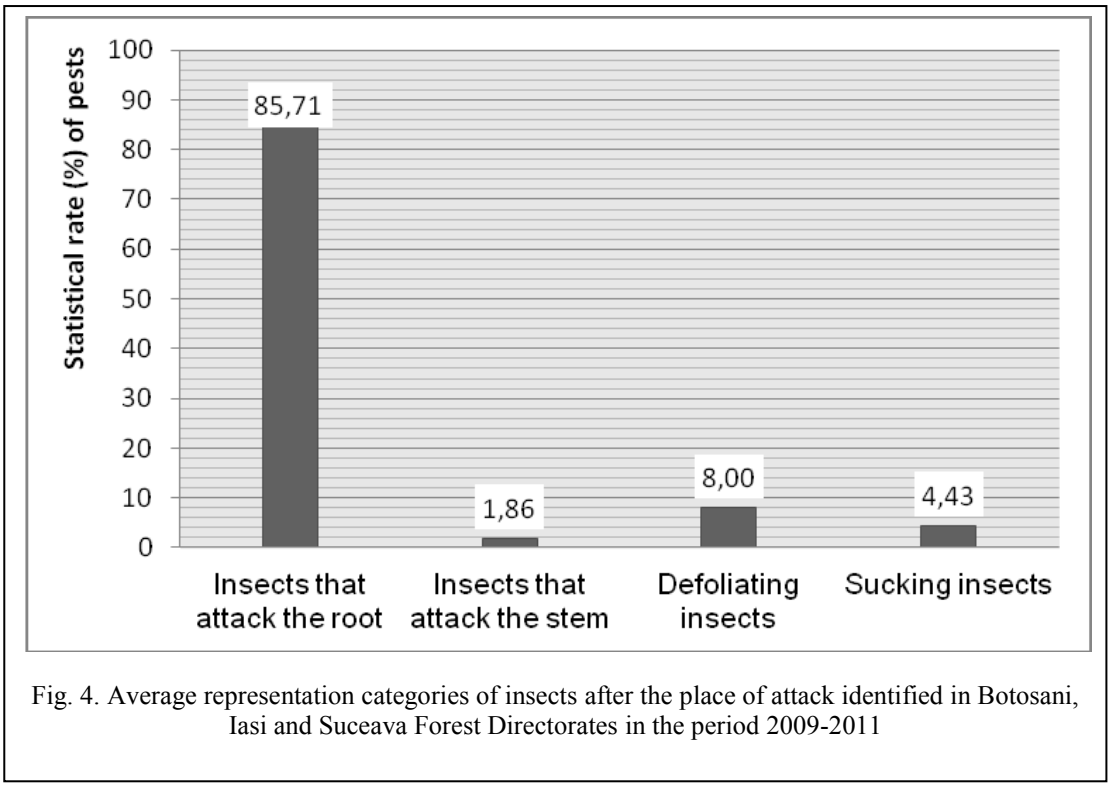

Fig. 4. Average representation categories of insects after the place of attack identified in Botosani, Iasi and Suceava Forest Directorates in the period 2009-2011

Practically, there are tracked up and forecasted all the categories of harmful insects, but the stress is set on those insects which attack the saplings root in the forest nurseries because the damages brought about by them are significantly higher.

Drawing a parallel between the affected areas by the harmful insects, it ca be found out that the beetle larvae, especially those of *Melolontha melolontha,* are outspreaded on the highest areas, their medium pith for the last 3 years consiting of 76,62%, the highest number being registered in Suceava Forest Directorate (88,39%), and the lowest in Iasi Forest Directorate *(fig.5).*

Defoliating insects represent appromimately 8,00% of the entire amount of harmful insects found inside Iasi, Suceava and Botosani forest nurseries, and the best represented are the beetles *Melasoma populi* (3,83%) and *Melolontha melolontha* (3,02%). The intensity of the attack of these defoliants was registered within 2009-2011 as being low to medium.

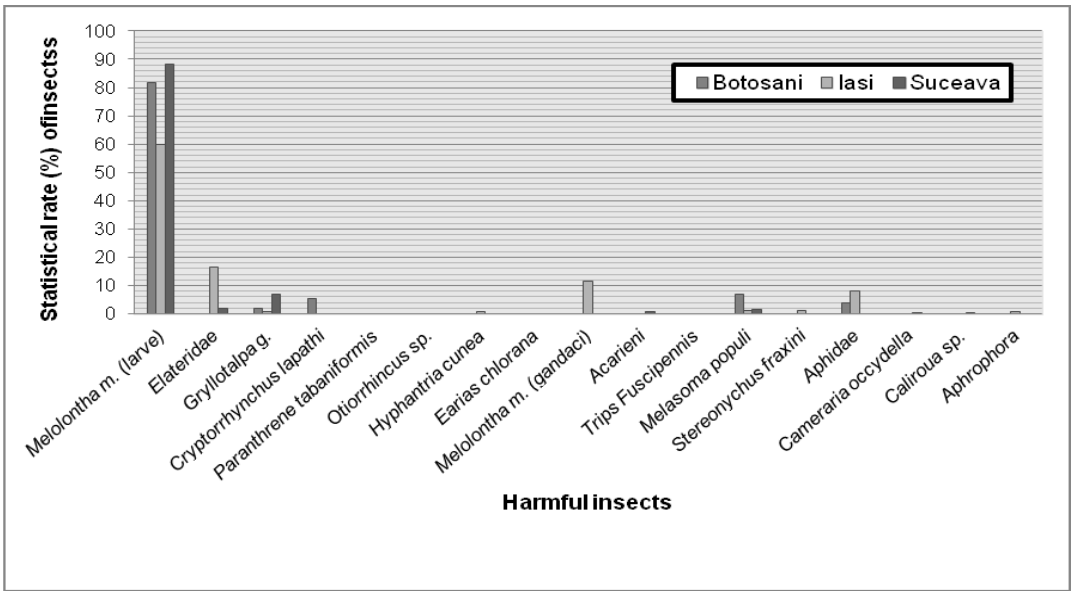

Fig. 5. The share of forest insect pests found in nurseries in Botosani, Iasi and Suceava Forest Directorates in the period 2009-2011

Insects which attack the stem are very few, around 5,57% of the entire amount of harmful insects and only in forest nurseries inside Botosani Forest Directorate on a area of 151 ares, both in 2009 and 2010. Generally, the intensity of these insects' attack was weak and very weak. Sucking insects represented by *Aphidae* (1,65 %) and *Aphrophora* (0,24 %) were registered upon an average of 4,43% of area and they didn't make any problem inside forest nurseries, their attack intensity being most of the time very week.

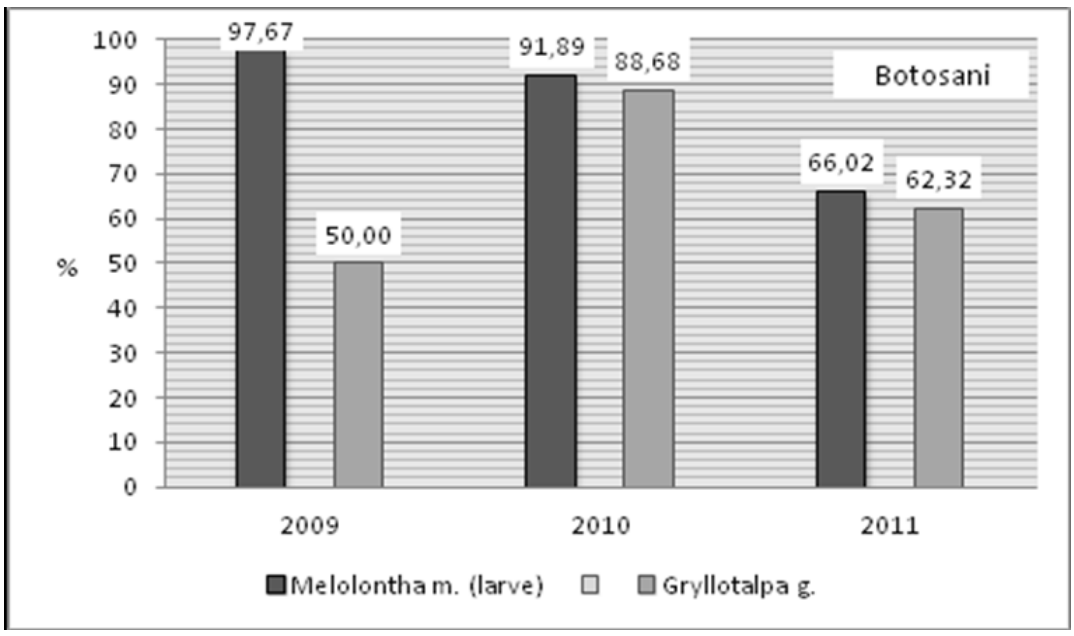

Fig. 6. The dynamics of insect pests root in Botosani Forest Directorate in the period 2009-2011

The dynamic of the most important pests inside forest nurseries which attack especially the root of the saplings, was influneced by a series of factors such as different weather conditions from one year to another, but also those from one area to another within the three forest directions, microstational conditions

specific to areas where the forest nurseries activated, control methods applied differently on areas where were signalized and forecasted pests attacks, but also other factors such as non-performance on time or at all of some forest activities and saplings protection in forest nurseries. In order to determine the dynamic of these pests in the last years, there was made a comparison between the first two or three most dangerous pests which have caused damages on higher areas. (*fig.6, fig.7 and fig.8).*

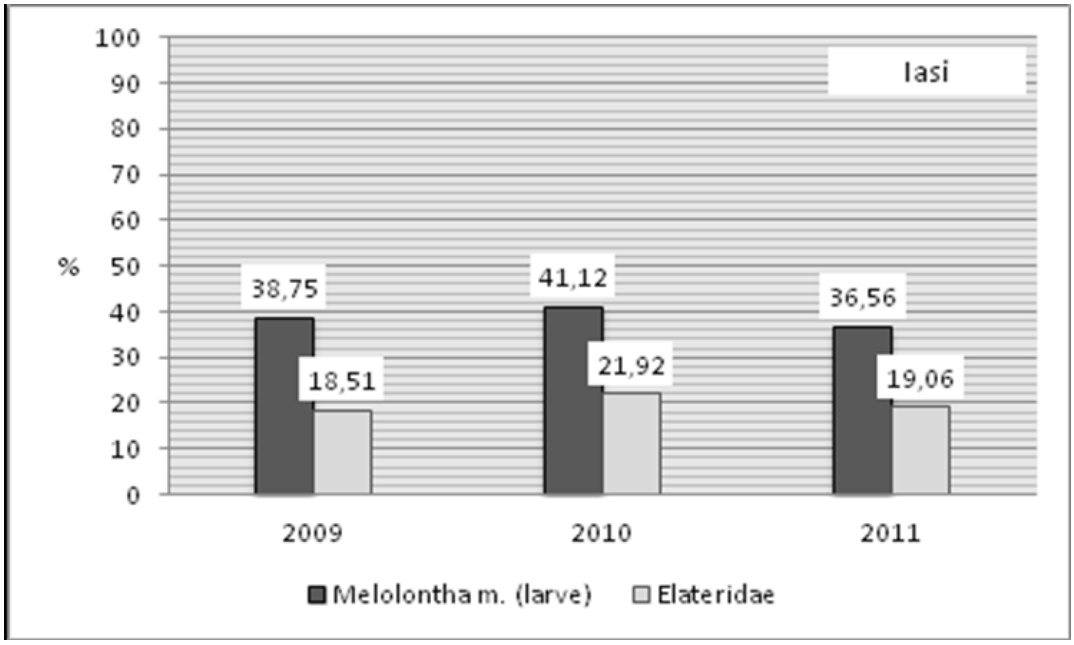

Fig. 7. The dynamics of insect pests root in Iasi Forest Directorate in the period 2009-2011

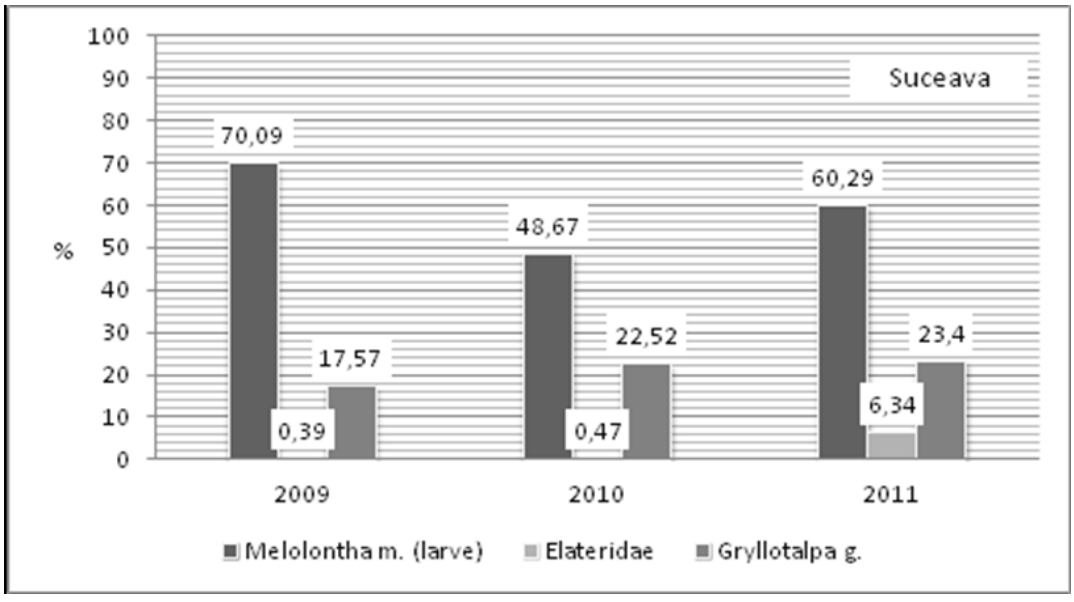

Figure 8. The dynamics of insect pests root in Suceava Forest Directorate in the period 2009-2011

The intensity of beetle larvae attack during 2009, 2010 and 2011 was generally from weak (43,02%) towards medium (24,58%), only in certain areas the intensity was strong (24,74%) or very strong (7,66%), and generally from weak to medium for *Elateridae* and *Gryllotalpa gryllotalpa*.

Inside forest nurseries of Botosani Forest Directorate, the intensity of the beetle larvae attack depending on the infested area was generally weak (59,91%) in 2009, but on 29,95% of area, the intensity was very strong. In 2010 the attack intensity was generally medium (48,94%) and weak (35,80%), and in 2011, medium and weak intensity was registered on 68,70% of area (*fig.9*).

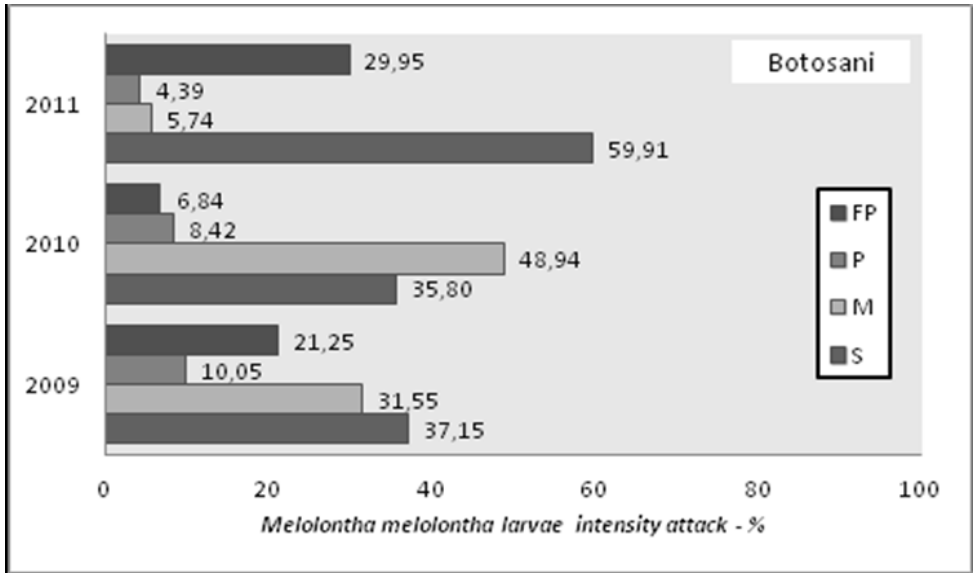

Fig. 9. The intensity attack of *Melolontha melolontha* larvae in Botosani Forest Directorate in the period 2009-2011

The affected area with the pest's larvae *Melolontha melolontha* inside Iasi Forest Directorate was at an average for 2009, 2010 and 2011 weak proportionally over 60%, in 2009 and 2010 being registered only weak and strong intensity of attack (at an average of over 30%). In 2011, the highest pith of the attacked area of these pests was represented by strong intensity (41,62%), medium and weak intensity attack being declared for 48,39% of the area (Fig.10).

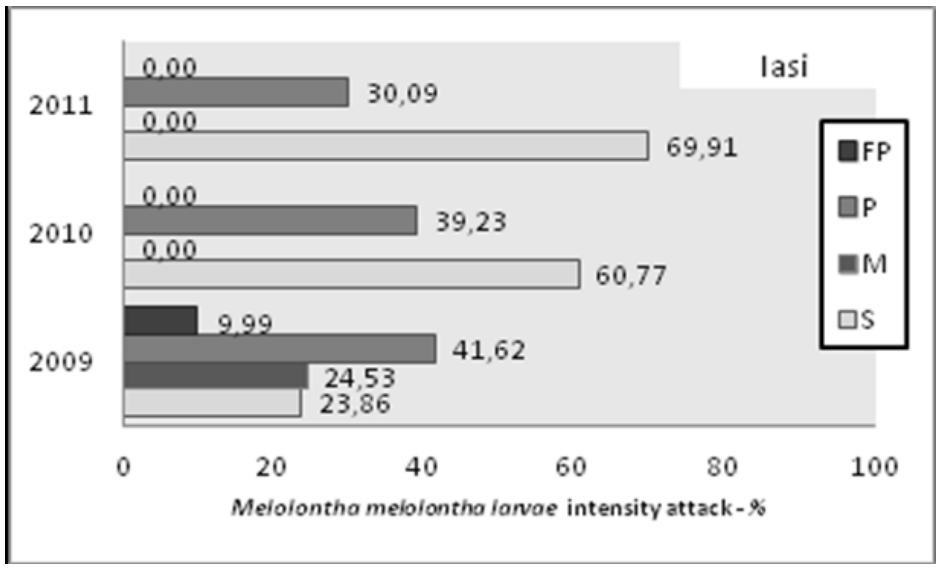

Fig. 10. The intensity attack of *Melolontha melolontha* larvae in Botosani Forest Directorate in the period 2009-2011

The intensity of beetle larvae attack registered inside forest nurseries of Suceava Forest Directorate fluctuated from one year to another, in 2009 was registered a percentage of 74,69 of the affected area as being of strong intensity, and only 17,33% weak intensity, respectivelly 6,36% medium intensity. In 2010, the situation was totally different, the weak intensity attack being registered on 70,95% of the area, and the strong one and very strong on only 5,47%, respectivelly 17,99%. In 2011, the beetle larvae infestation had a medium intensity on approx. 74% of area, and the strong one and very strong registered only on a total amount of 14,63% of area (*fig.11*).

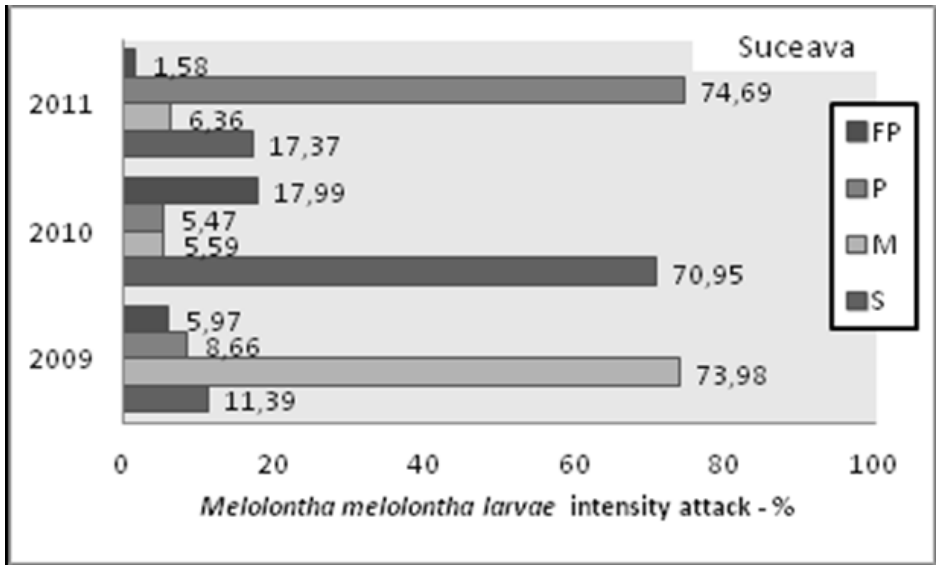

Fig. 11. The intensity attack of *Melolontha melolontha* larvae in Botosani Forest Directorate in the period 2009-2011

Conclusions

The area of the forest nurseries inside Botosani, Iasi and Suceava Forest Directorates was, within 2009-2011, of over 180 ha, the highest pith given to Suceava Forest Directorate with approx. 106 ha, followed by Iasi Forest Directorate with approx. 50 ha, and Botosani Forest Directorate with little over 30 ha. On 90% out of this entire area there were registered harmful factors which caused significant damages in certain respects, but which were generally kept under control through applied prevention and control methods.

The results of the research indicate the participation of a majority of biotic pests with 90,94% compared to 9,06% of the abiotic ones. Amongst biotic pests, the insects represent upon an average 65,17%, vegetal parasites 17,671% and harmful mammals 8,28%. Harmful insects had the higher rate within Suceava Forest Directorate (74,28%), and the lowest inside Botosani Forest Directorate (53,69%).

Analyzing the evolution of the harmful insects, there can be observed a decrease of their pith for the past 2 years with 11 up to 13 percentage.

Analyzing the insects' place of attack, it can be observed that upon an average for Botosani, Iasi and Suceava Forest Directorates in the last 3 years, the highest pith belongs to insects attack the root of the saplings (over 85%), followed by the defoliating, sucking insects and stem pests in forest nurseries.

The intensity of beetle larvae attack during 2009, 2010 and 2011 was generally weak (43,02%), towards medium (24,58%), only in certain areas the intensity was strong (24,74%), or very strong (7,66), and generally from weak to medium for *Elateridae* and *Grylotalpa gryllotalpa*.the intensity of the other category of pests was registered as being weak and medium, spontaneous strong or very strong.

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