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Original Article

The Study of the Efficacy of Wheat Herbicidation. Note I: The Use of Multifunctional Nozzle with Laminar Jet of LU Type

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Abstract

It is well known that plant protection activity includes all the measures taken to prevent and combat all pests, diseases and harmful factors that cause injury to crops. The experiment was conducted in Gilău, Cluj County, on an experimental field. The total area of the experimental field is 6000 m^2 with a width of 50 m and a length of the field 120 m. The biological material was represented by wheat cultures of the Andrada variety. LU multifunctional lamellar jet nozzles are used. The statistical processing was done with the STATISTICA v. 8.0 program. Our study shows the performances accomplished by the use of the multifunctional nozzle with laminar jet of LU type, for different dispersion pressures and heights. According to Box-Plot diagrams, and clusters resulted from Cluster Analysis, there are identified differences between the amount of debts and uniformity of debits function of dispersion height and pulverization pressure.

Keywords: herbicidation, multifunctional, nozzle, LU.

1. Introduction

Plant protection activity includes all the measures taken to prevent and combat all pests, diseases and harmful factors that cause injury to crops [6]. It includes, in addition to prevention and control measures, work to identify the presence of pests and diseases as well as prognosis of their likely evolution in order to plan the plant protection actions that are required to be judiciously planned [1, 3].

Extending combat treatments to very large areas and repeating them several times even during the same growing season leads to the spending of significant funds, which may call into question their cost-effectiveness.

In order to increase the effectiveness of the control work, it was intended to investigate the extent to which it is possible to reduce the number of treatments applied in a vegetation season as well as to reduce the amount of phytosanitary substance administered [2, 4].

Current studies and research on methods and equipment for agrochemical applications are in line with new trends in the practical use of sustainable agriculture concepts.

The uniformity of distribution on the working width leads to an increase in the quality of work index and, consequently, the increase of the efficiency of the crop treatment and yield [5].

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2. Material and Method

The experiment was conducted in Gilău, Cluj County, on an experimental field.

The total area of the experimental field is 6000 m^2 with a width of 50 m and a length of the field 120 m. The biological material was represented by wheat cultures of the Andrada variety, which was created at the Turda Agricultural Research and Development through repeated hybrid selection from the hybrid combination made between Dropia variety (created at Fundulea) and T. 57-90 line (Turda Resort) and belonging to the species *Triticum aestivum* (L.), ssp. vulgare (Will.), Host, MacKey, variety ferrugineum (Korn.), With red spruce, aristocrat and red grain.

This resulted in the Andrada wheat variety of the Ferugineum variety, which is resistant to drought and very productive, with production in the three years of research ranging between 7,000 kilograms per hectare and 7,600 kilograms per hectare.

LU multifunctional lamellar jet nozzles are universal in character and feature multiple applications: provide high precision scattering across the entire pressure range from 1.5 to 5 bar, spray a balanced droplet spectrum, the proportion of coarse droplets being sensibly reduced, are used for spraying plant protection products and growth regulators (fungicides, pesticides, insecticides, acaricides).

The construction features of the LU multifunctional lamellar jets are as follows:

- the spray angle is 120 °;
- are made of plastic (POM) with a ceramic or stainless steel spray head;
- the flow range of the nozzle is 01-08, a flow rate of 03 is used;
- the pressure range is from 1.5 to 5 bar, the investigation was carried out at a pressure of maximum 3 bar;
- the construction is compact and has a length of 10 mm;
- spraying was done in finemedium and uniform drops;
- the amount of substance administered was dependent on the pressure and size of the nozzle used.

The statistical processing was done with the STATISTICA v. 8.0 program.

3. Results and Discussions

Under the conditions of wheat crop erbicidation in the experimental field, using the LU type multifunctional jet nozzle, our study highlights different evolutions of spray flows, depending on the reference point distances ranging from 30 cm to 500 cm, at different spray pressures and heights (Fig. 1).

Spray rates at 3 bar pressure and 30 cm height have a wide range of values ranging from 150 L/h to 300 L/h and are characterized by high variability (Fig. 1.a).

At a pressure of 3 bar and a height of 60 cm, too, the flows are in a wide range, 200-350 L/h, superior to the one previously discussed (Figure 1.a), with high variability (Fig. 1.b).

At the 50 cm spraying height, the total flows are in a reduced range, ie 180 - 280 L/h corresponding to the pressure of 3 bar (Fig. 1.c), unlike those recorded at the same height but at the pressure of 6 bars, varying in a much broader range, ie 250-350 L/h, being characterized by much lower variables (Fig. 1.d).

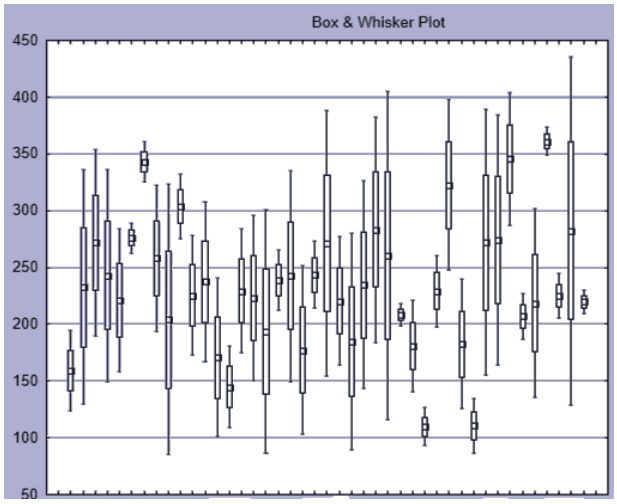
At a height of 65 cm, the Box-Plot diagrams show spray rates in the range of 180 - 240 L/h (Fig. 1.e) for 3 bar pressure and 260-360 L/h (Fig. 1.f), both of which are characterized by moderate variability.

The cluster analysis applied to the LU laminar jet flows with which the wheat crop is herbicidated in the experimental field studied in the doctoral thesis, also reveals different characteristics of these according to the pressures and heights of the herbicide spraying (Fig. 2).

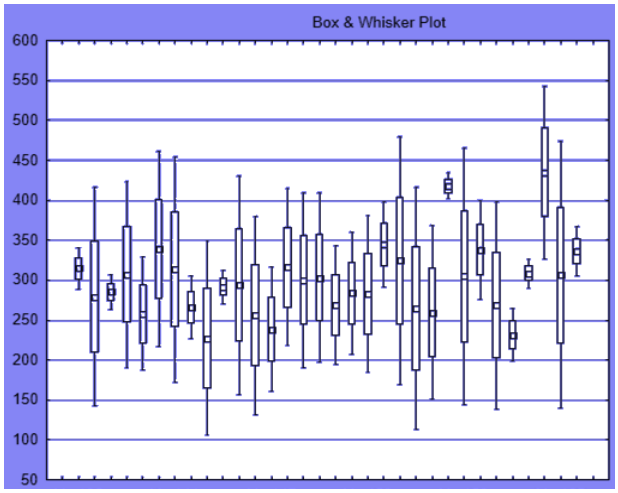
For a spray height of 30 cm at a pressure of 3 bar, two main clusters of herbicide spraying flows are shown, the first with two subgroups, corresponding to four flows, and the remainder corresponding to the other flows (Fig. 2.a), and for the pressure of 6 bar, two clusters, only the first, corresponds to a single spraying flow, and to the other three subclusters, with their branches (Fig. 2.b).

For herbicide spraying height of 50 cm, both spraying pressures, namely 3 bar and 6 bar, two clusters, the first represented by a single flow, and the second of a series of sub-clusters and branches (Fig. 2.c and Fig. 2.d).

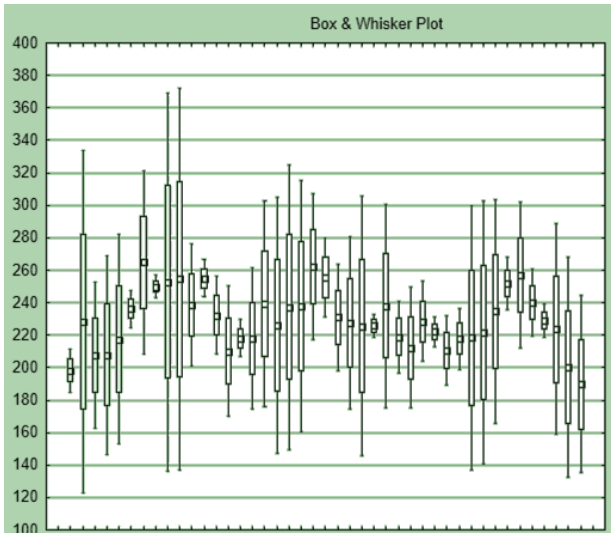
At a height of 65 cm for a pressure of 3 atm, the herbicide spraying flows are grouped into two clusters, the first with two sub-subsets, one of which corresponds to a single flow and the other one flows in several subdivisions of the cluster, and the second with two subclusions of which one corresponds to a single flow, and the second one has branches corresponding to a number of seven flows (Fig. 2.e). At the 6 atm pressure, two clusters are reported, the first corresponding to a single flow, and the second, divided into two subclusters, both with branches corresponding to the other recorded flows, the first subcluster being characterized by a plurality of branches and the second by 5 branches corresponding to the corresponding flows (Figure 2.f).



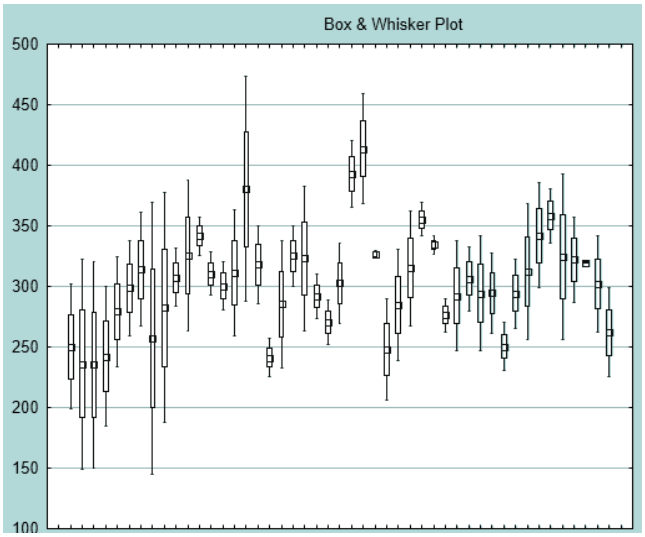
a - p = 3 bar, h = 30 cm



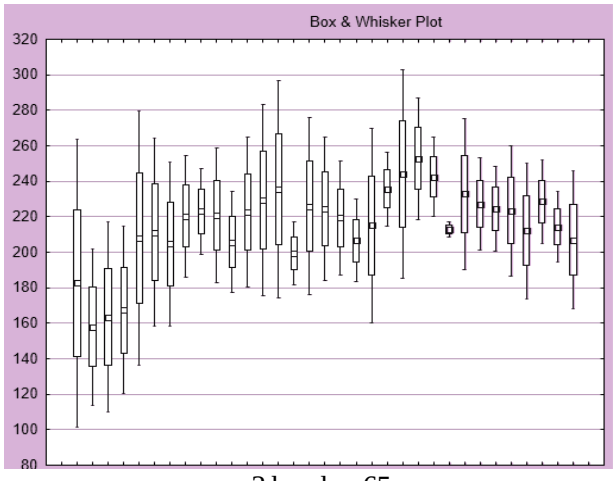
b - p = 6 bar, h = 30 cm



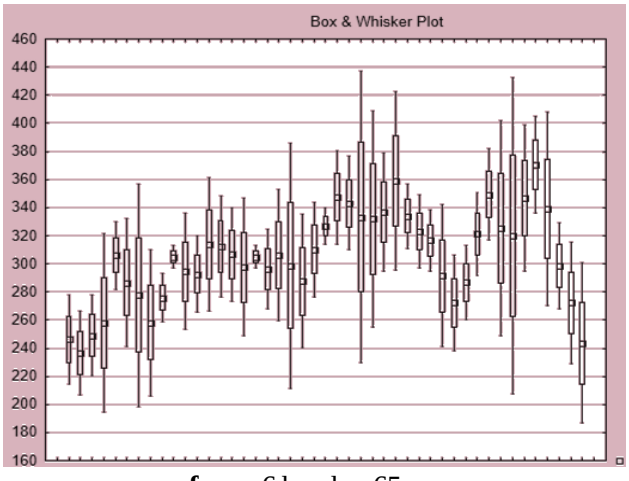
c - p = 3 bar, h = 50 cm



d - p = 6 bar, h = 50 cm

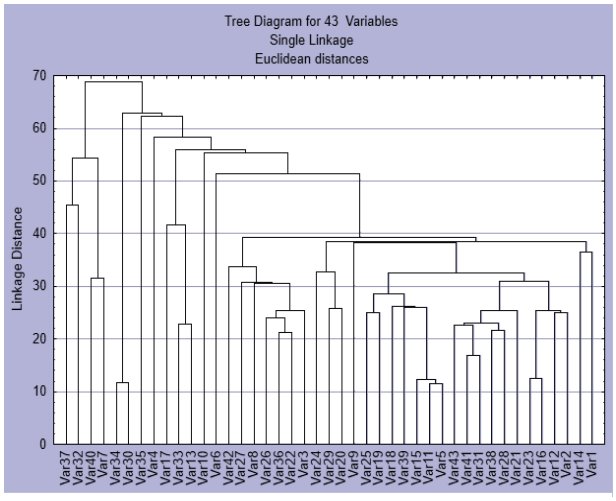


e - p = 3 bar, h = 65 cm

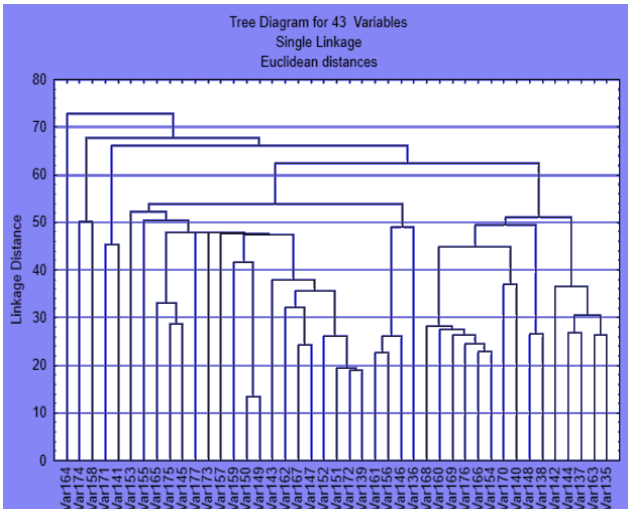


f - p = 6 bar, h = 65 cm

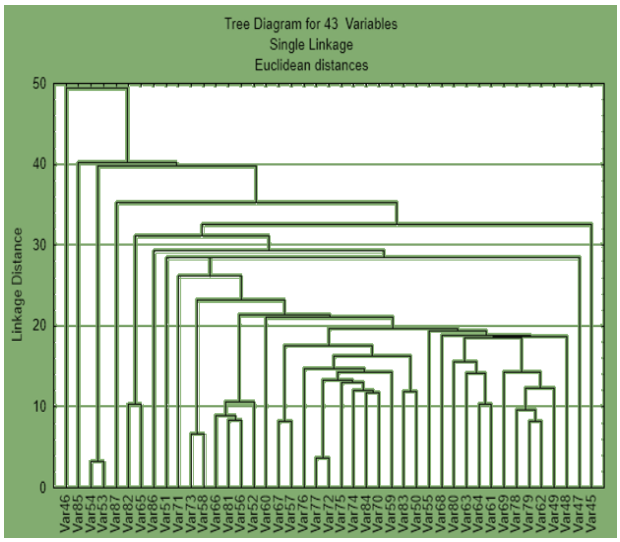
Figure 1. The Box-plot diagrams for wheat herbicidation flow, with multifunctional nozzle with laminar jet of LU type, for different dispersion pressures and heights



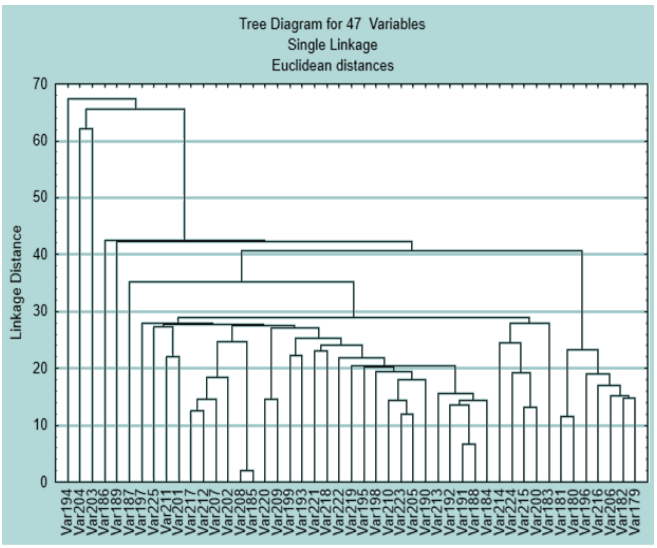
a - p = 3 bar, h = 30 cm



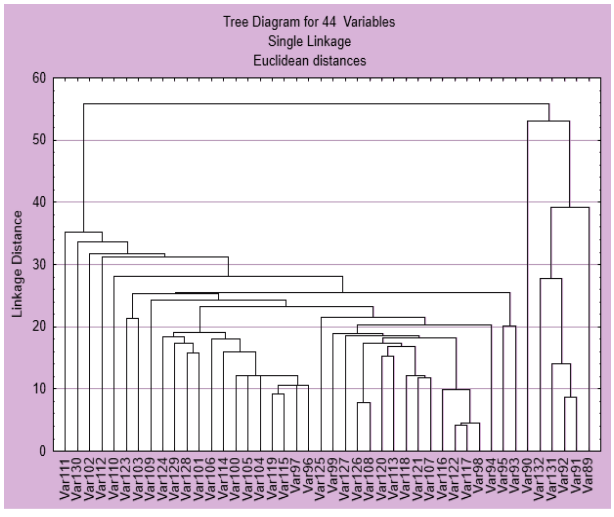
b - p = 6 bar, h = 30 cm



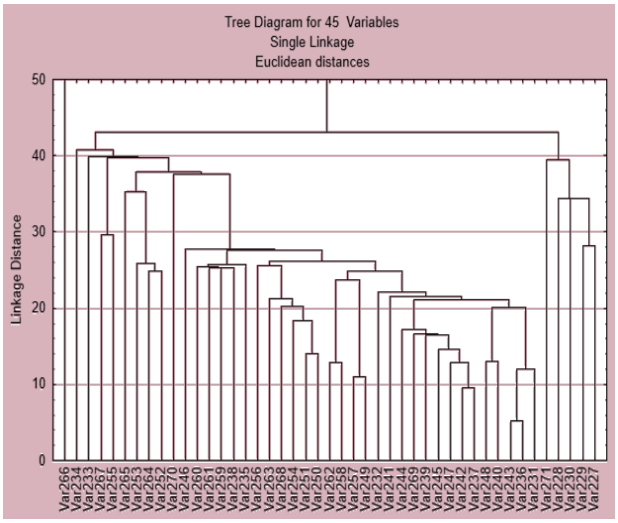
c - p = 3 bar, h = 50 cm



d - p = 6 bar, h = 50 cm



e - p = 3 bar, h = 65 cm



f - p = 6 bar, h = 65 cm

Figure 2. The cluster analysis for wheat herbicidation flow, with multifunctional nozzle with laminar jet of LU type, for different dispersion pressures and heights

4. Conclusions

Our study shows the performances accomplished by the use of the multifunctional nozzle with laminar jet of LU type, for different dispersion pressures and heights. According to Box-Plot diagrams, and clusters resulted from Cluster Analysis, there are identified differences between the amount of flows and uniformity of flowsfunction of dispersion height and pulverization pressure.

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