

## Operational comparison of two types of tractor sprayers (microner and boom-type) against wheat crop weeds

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**Introduction:** Nowadays, the tractor mounted boom sprayer is used in many agricultural fields. These sprayers have many advantages compared to other sprayers, but in Iran, their field efficiency is much lower than that of the developed countries, because the tank volume and consumption of pesticides per hectare is often so high that spraying per hectare takes a long time for handling the solutions and transporting the sprayers. Also spray droplet size is ordinarily high and its distribution is not uniform. So, often spraying and dropping top parts of plants on the earth is inevitable. According to studies carried out in the country during the years 2005-2008 in the agricultural research centers in several provinces such as Khuzestan, four types of sprayers including tractor mounted sprayer, atomizer, microner, and electrostatic atomizer were studied and some of the results obtained include the following. From the point of view of percentage of crop loss, tractor mounted sprayer has the highest percentage, but microner sprayer had the lowest. From the point of view of the solution of consumption amount and spraying cost per hectare, the operation of the tractor mounted sprayer and electrostatic sprayer had the highest and the lowest ranks, respectively. Atomizer sprayer had the highest effect on the percentage amount of weed control, but it requires a high amount of water consumption, high drift and low operation (Safari and Lovaimi, 2010).

**Materials and Methods:** The experiment was carried out during 2012-2013 in the field of agricultural research located in the Mollasani city located 20 km near Ahvaz. In this study, tractor mounted spinning disk sprayer (mounted microner sprayer) was evaluated in comparison with conventional boom sprayer on weeds control. The treatments included medium (3500 rpm) and low (2000 rpm) speed rotation disk sprayer and two types of nozzle in conventional boom sprayer. One of them was an Italian tee jet nozzle and the other one was flowage nozzle and they were compared with control treatment. Experiment design was Randomized Completed blocks Design (RCBD) with seven replications. Parameters such as spraying quality, diameter, volume mean diameter and numerical mean of droplets, spray quality factor, the percentage of crop loss, weeds dry weight and number, percentage of weed control and the drift were measured. The results were compared with a control treatment. For comparative tests between the sprayers, the measured parameters were compared with each other using SAS software.

**Results and Discussion:** Volume mean diameter and numerical mean diameter in tractor mounted microner sprayer with medium and low speed rotation disk treatment and also tractor mounted boom sprayer with Italian fan nozzle treatment were metered 162.5, 461 and 635.5 micron, and 138.5, 355 and 452.5 micron, respectively. Volume mean diameter related to numerical mean diameter was obtained to be 1.17 and 1.3 for tractor mounted microner sprayer with medium and low levels of speed rotation disk, and 1.4 for tractor mounted boom sprayer with Italian fan nozzle, respectively. Whenever the spray quality coefficient is closer to one, the spray quality is better. So microner sprayer treatment with 1.17 coefficient has the best spray quality. The results about weeds control numbers showed all treatments had significant difference with control treat in 1% levels (Table 3). Evaluating all treatment results showed the flowage nozzle with 22.57 weeds number and 27.26 g. weeds dry weight had significant difference with other treatments in 1% levels that was the best operation (Table 4). In comparison of sprayers' technical evaluation, all treatments had significant difference in 1% levels, so the flowage nozzle with 191.66 l.ha solution consumption and microner treatment with medium speed rotation disk with 44.38 l.ha solution consumption were the most and the least treatments. And they have significant difference in 1% levels (Table 5). The most percent of crop loss belonged to sprayer boom tractor with flowage nozzle (27.03%) and the least belonged to microner boom sprayer tractor (6%). The most percent of drift belonged to microner boom sprayer tractor with medium speed of rotation disk (76.19%) and the

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least belonged to sprayer boom tractor with flowage nozzle (23.81%). The best spraying quality (1.17) was for microner with medium rotation disk treat (Table 6).

**Conclusions:** Performance of a sprayers mostly depends upon the working of its nozzle. In this research, two different sprayers with three typical nozzles were used to control wheat crop weeds. In general, the tractor sprayer of microner (40 million Rials) is more expensive than the typical boom sprayer, and because most farmers own tractor mounted boom sprayers the most convenient and least expensive method is to use Italian fan nozzle (standard) due to lower cost and higher performance. However, there are many effectiveness parameters to select a suitable sprayer for the field. But on the bases of the sprayer's technological specifications, weed control parameters, economical parameters and etc., technical methods such as Analytical Hierarchy Process (AHP) or other ones are proposed to choose the better sprayer for pesticide applications.

**Keywords:** Microner, Nozzle, Sprayer, Tractor, Treatment, Weeds