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INTERACTION BETWEEN SOME FUNGICIDES AND APPLICATOR-TYPES OF SPRAYER IN CONTROLLING POWDERY MILDEW DISEASE OF WHEAT.

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ABSTRACT

The objective of this work was to study the interaction between three systemic fungicides belonging to triazole group and three mechanical applicator types of sprayer, i. e. high volume (HV), low volume (LV) and ultra low volume (ULV) in controlling wheat powdery mildew. This study was carried out at Gemmeiza Research station during two growing seasons (2004-2005).

The fungicides eminent (Tetraconazole)and sumi-8(Diniconazole) gave the highest values of efficacy % in controlling the disease with either of L.V. or H.V.(93.75 & 96.25 % and 87.75 & 93.75 %) and (89.58 & 93.75 % and 85.42 & 93.75 %) sprayers in 2004-2005, respectively. While, the fungicide tilt (Propiconazole) showed the lowest values in this respect with all sprayer types. Good and significant interactions were found between the fungicides and the type of sprayer. The sprayers L.V. and H.V. gave the lowest mean of disease severity (10.55, 6.54 % and 13.33, 10.00 %) respectively in the years 2004-2005. While ULV sprayer showed the highest mean of disease severity (53.33 and 51.66 %)

Technical laboratory tests indicated that the ULV applicator produced very small droplets (196 droplets per cm^2 of 92 µm in diameter). The LV applicator produced small spray droplets (144 droplets per cm^2 of 174 µm in diameter), while the HV applicator produced relatively large spray droplets (59 droplets per cm^2 of 213 µm in diameter). Spray using HV applicator depend on the pressure of the handle pump. Also, the LV applicator works using air pressure with air velocity about 43.7 m/sec. The two sprayers produced large droplets compared with the ULV sprayer. Droplets of HV and LV interfuse the heavy growth plants with drag force by pressure and air velocity respectively. Meanwhile, spray using ULV applicator which works with centrifugal force produced very small fine droplets that have low speed. Therefore, it's ability to interfuse the heavy growth plants will not occur.

These results put spot light on the importance of choice the type of sprayer to the kind of the crop plant. The plants has heavy growth i.e. wheat (300-350 tiller/m^2) must be sprayed with sprayer has drag force of droplets while the crops has vast leaves i.e. cucurbitaceae must be sprayed with ULV sprayer for controlling plant diseases.

INTRODUCTION

Powdery mildew caused by *Erysiphe graminis* is one of the commonest and most widespread wheat diseases. Because of its very widespread distribution, frequent occurrence and ability to attack all wheat cultivars ,powdery mildew can cause extensive damage .Early infection results in leaf loss and impairment of shoot and root development ,this becomes evident during the harvest by the reduced number of ear –bearing tillers. The most frequent form of damage following early- attack , if attack occurs during the main growth stage ,starch storage in the grains is reduced leading to aloes of brewing quality or shriveled grain information .Chemical control to powdery mildew disease has been considered the main goal to increase the wheat production especially with the absence of resistant varieties .

Inefficiencies of the chemical application process are inherent to the complex structure of the target crop, the location of the target disease within the crop canopy, and the method and equipment used for spray application. Spray penetration and deposition characteristics and control efficacy are among the most often considered factors in applying the research. The inefficiency and accuracy of the agriculture chemical application can be alleviated by understanding the fundamental concepts of transport, penetration and deposition of the spray in correlation with the plant canopy structures (Giles, 1989). Farm equipments for applying fungicides and pesticides plays an important role in controlling plant diseases. Several types of spraying devices had been used in agricultural applications (Awady and Afifi, 1976 ;Ismail and Bder ,2004 and El-Meseery and Abd El-Fattah 2005). To increase the efficiency of spraying, and decrease the injury percent and the quantity of liquid, different fungicides were used. Awady (1977), and Azime et al., (1985) showed that the atomizer has three atomization functions, to regulate flow-rate to form and control droplet size and to disperse and distribute the droplets in a specific pattern. Keppner et al., (1982) mentioned that the degree of atomization depends upon the characteristics and operating conditions of the atomizing device and upon the characteristics of liquid being atomized. Moustafa and Ismail(2003) studied the effect of the different fungicide applicator types on the efficacy of fungicides used to control late blight disease caused by *Phytophthora infestans* on potato. They found that, using the ULV applicator resulted in reduction of the fungicide amount needed to perform appropriate control of this disease from 400 L/fed, (the recommended amount) to 50 L/fed. The lowered amount of the fungicide run-off in turn saves the environment and decreases the crop production costs.

This work was carried out to study the interaction between some fungicides and technical applicators (sprayers) in controlling wheat powdery mildew .

MATERIAL AND METHODS

The experimental layout:

This study was carried out at Gemmeiza Research Station in 2003/2004 and 2004/2005 growing seasons. Split – plot design was followed in this experiment. The main plots were the type of sprayer, while the tested fungicides comprised the sub- treatments. The highly susceptible wheat variety, Sakha 61 was grown in 36 plots (3 x 1.2m). Grains were drilled in rows spaced 20 cm apart, and the plot contained 6 rows. The experimental plots were surrounded by a border from the susceptible variety little club with one meter .

Inoculation technique:

For inoculation, the powdery mildew culture was raised on little club seedlings grown in 10 cm pots under green –house conditions from infected plants collected from the trap nursery. Two pots of 10 days old culture were potted in the middle of the border every 2 meter. Later after one week, the infected pots were rubbed over the border plants.

The tested fungicides:

Three systemic fungicides belonged to triazole group were used in this study namely; Diniconazole, Propiconazole and Tetraconazole (Table 1). These fungicides were sprayed twice; once the powdery mildew appear and after 15 days of the first spray. The control treatments were sprayed by water. Efficacy of the fungicides was determined according the equation adopted by Rewal and Jhooty (1985) as follow:

$$Efficacy\ \% = \frac{Infection\ in\ control\ \% - Infection\ in\ treatment\ \%}{Infection\ in\ control\ \%} \times 100$$

Table 1: Trade name, concentration, formulation, common name, chemical name and dose of the tested fungicides.

Trade name/concentration/ formulation	Common name	Chemical name	Dose
Sumi-8 5% EC	Diniconazole	(E)-(RS)-1 (2,4dichloro-phenyl) 4,4di-methyl-2-(1H-1,2,4-tnazol-1-y) pent-1-en-3-01(IUPAC)	35 ml/100 L.
Tilt 10% EC	Propiconazole	1-(2,4-dichlorophenyl)-4-propyl 1,3-dioxolon-2-Yl methyl-1H-1,2,4-	100 ml/100 L.
Eminent 12.5% EW	Tetraconazole	+)-2-(2,4dichlorophenyl)-3-(1,2,4- triazol-1-yl) propyl 1,2,2-tetrafluoro-ethylether (IUPAC)	100 ml/100 L

DISEASE ASSESSMENT:

Infection severity was estimated visually as a percentage of leaf area covered with colonies, according to the scale o-6 (Baicu,1968) which : o = no visible colonies on leaves ;1 = 1-9 % of leaf area covered with colonies ; 2 = 10- 19 % of leaf area covered with colonies; 3 = 20- 35 % of leaf area covered with colonies; 4 = 36 – 50 % of leaf area covered with colonies ; 5 = 51 – 75 % of leaf area covered with colonies 6 = more than 75 % of leaf area covered with colonies. Twenty plants were selected randomly at each plot to estimate disease severity on the whole plants.

Yield components :

Grain yield and 1000 kernel weight of the each treatment as well as the control treatment were determined and The increase percentage was calculated was detected according to the formula adopted by:

Increase % = Treatment – control / control X 100

Engineering consideration:

The engineering specification referring to the types of sprayers under experiment were:

1- The sprayer No 1 (Knapsack sprayer)

This sprayer has high volume of droplet (HV) and has metal hand lance tube with one nozzle (hollow cone type).

The stream of liquid flowing out of the swirl chamber (Fig. 1-a, 1-b) is may subjected to the action of the following internal forces:

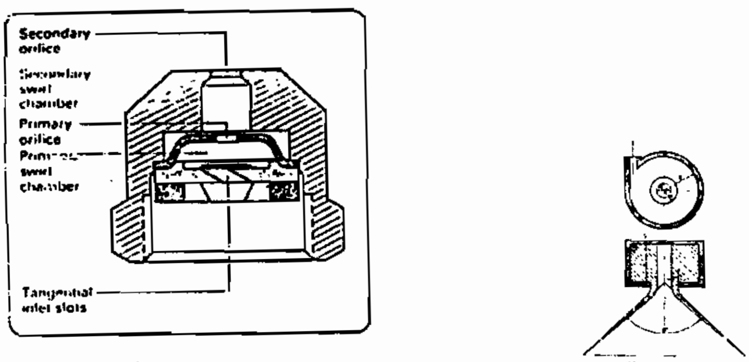
1-Surface tension which opposes the breaking of the stream and tends to shape the smallest possible surface.

2-Viscosity which opposes deformations of the stream.

3-Cohesion opposing the breaking up the stream as a result of a difference in velocity of the individual points.

As show in (Fig. 1) the hollow cone type have a swirl chamber, which it can be positioned immediately after the inlet orifice to reduce the proportion of small droplets produced by one nozzle and thus reduce drift.

The liquid is conveyed to the swirl chamber (Fig. 1-b) with radius "R", through the opening with a radius "r_0". Under the effect of the pressure produced by the pump action, the liquid in the chamber begins moving in the direction of the axis and is also set into a revolving motion produced by the initial angular momentum.



(a) (b)

Fig. (1): High volume sprayer, the liquid's outflow from the swirl nozzle.

At every particular point of the chamber a situation may be expressed by using the Bernouillie's equation as follow:

$$\frac{P}{Q}+\frac{V^2}{2g}+\frac{u^2}{2g}=H$$

Where;

H = the total pressure supplied by pumping action, Pascal

P = the static pressure at a particular point, Pascal

Q = the amount of liquid discharge, L/fed

V = the tangential velocity of the liquid element, m/sec

u = the axial velocity of the liquid, m/sec

g = the acceleration due to the earth gravity, m/sec^2

2- The sprayer machine No 2 (LV) (Air carrier sprayer)

The engineering consideration of the air carrier sprayer nozzle as shown in Fig. (2) are:

1- the sprayer have rotating radial tube.
2- The liquid breaking in a stream air.

The blower of the sprayer are actuated by an internal combustion engine of about 2 HP and mounted on a frame carried on the operator's shoulders. The engine drives the impeller and the liquid flows down by gravity to the nozzle situated at the outlet orifice of the air tube (Fig. 2-a)

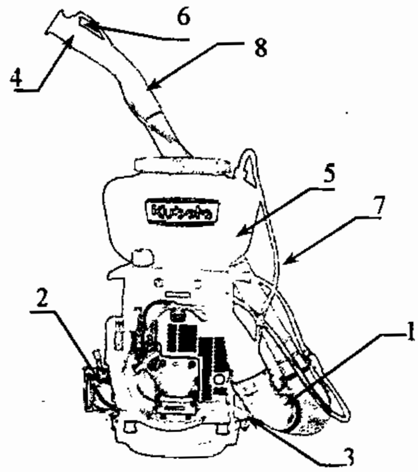


Fig. (2-a): The air carrier sprayer.

1- Engine 2- Fuel tank 3- Fan
4- Nozzle 5- Liquid tank 6- Valve
7- Liquid conduit8- Air tube

By zooming the shape of nozzle in Fig. (2-a), the Fig. (2-b) is obtained. The nozzle of the air carrier sprayer (Fig. 2-b) meet each of liquid sprayer and the ejected air. A droplet of liquid is subjected to external forces resulting from resistance of the medium as well as the internal forces arising from the surface tension.

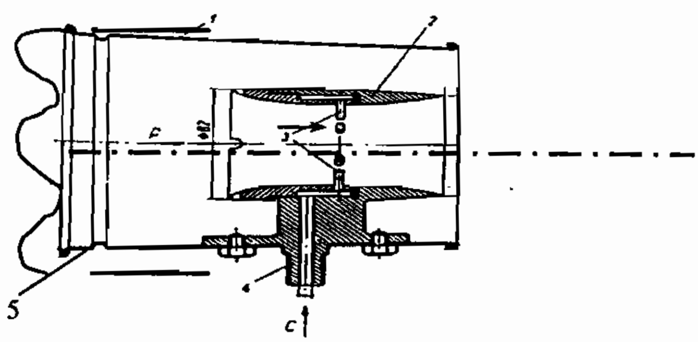


Fig. (2-b): The nozzle fan carrier sprayer.

1- Casing 2- Venture tube 3- Injector tubes
4- Connector pipe. c- Liquid flow direction p- air flow direction

In general, the process of droplet breaking can be presented if;

$P_i \geq P_a + P_s$

Where;

P_i = the internal pressure of a constant volume.

P_a = the external pressure.

P_s = the pressure produced by surface tension for a sphere

On the other hand the Ps is equal to

$$P_s = \frac{2\sigma_t}{r}$$

Where;

σ_t = surface tension, N/cm^2

r = the radius of the droplet, cm

3- The sprayer No 3 Ultra-low volume (ULV)

Referring to the position of spinning disc "ULV" during operation in field), the inclination angle of the spray shape distribution may take the form as shown in Fig. (3).

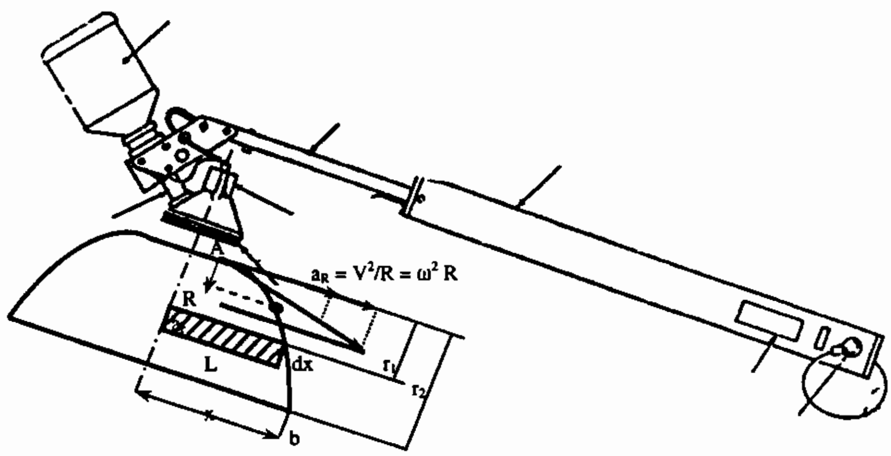


Fig. (3): The imitation of the spinning disc during operation in the field.

The volume of spray applied is restricted to prevent the flooding of the nozzle. A suitable formulation and flow rate are selected to that at a given rotational speed droplet formulation form ligaments with minimal number of satellite droplets.

The sprayer distribution form but only depends on the selected size but also on the engineering parameter of spinning-disc, sprayer. The angle of spinning-disc the number of disc rotation, and the disc set level are the most important parameters controlling the width of spray out.

The velocity (v) of the droplet going out from the rotating disc of sprayer is the resultant of the tangential velocity of disc end "V_t" and of the radial velocity "V_r^2" at the moment of leaving the disc.

Let us assume a mass of droplet "m" and the atomizer (rotary disc) revolves around its axis (Fig.3) at constant angular velocity "ω". The only force which affects the droplet's motion is the centrifugal force "m ω^2 x", where "x" is the droplet's momentary distance from the axis of rotation. The mass of the droplet can, as negligibly small, be disregarded in the calculation.

As referring to the Fig. (3); let assume the distance between the splat of distribution of spray and the atomizer disc as r_1 and the distance from the end as r_2. The relative radial velocity of the droplet at the point "A" is denoted by "V_a" and at "B" by "V_b". On the displacement dx, the force "ma" performs the work.

$$\frac{dL}{dx} = m\,x\,\omega^2 \qquad (1)$$

$$dL = m\,\omega^2\,x\,dx \qquad (2)$$

$$\int_a^b dL = m\,\omega^2 \int_R^x x\,dx \qquad (3)$$

$$[m\,V_b^2 - m\,V_a^2] = \frac{1}{2} m\,\omega^2 (x^2 - R^2) \qquad (4)$$

Hence, on integration and reduction

$$[V_b^2 - V_a^2] = \frac{1}{2} \omega^2 (x^2 - R^2) \qquad (5)$$

$$\therefore V_b = \sqrt{V_a^2 + \frac{1}{2} \omega^2 (x^2 - R^2)} \qquad (6)$$

But $V_b = \frac{dx}{dt}$, therefore after separation of the variables

$$dt = \frac{dx}{V_b} \qquad (7)$$

$$dt = \frac{dx}{\sqrt{\frac{V_a^2}{\omega^2} + \frac{1}{2}(x^2 - r^2)}} \qquad (8)$$

$$dt = \left[\frac{2V_a^2}{\omega^2} + x^2 - r^2\right]^{-\frac{1}{2}} dx \qquad (9)$$

On integration and assuming that for condition x = r and t = 0 we obtain;

$$\int dt = \int [2V_a^2/\omega^2 + x^2 - r^2]^{-\frac{1}{2}} dx \qquad (10)$$

$$\omega t = \left[x + \sqrt{\frac{2V_a^2}{\omega^2} + x^2 - r^2} \right] \Big/ \left[r^2 + \frac{V_a}{\omega} \right] \qquad (11)$$

Using the above equation, we can calculate the relative radial velocity "V_a", if we know the disc of spryer radius "r" it's easy to determine the distance of the droplet from the rotation axis to the end of the spray distribution surface.

According to the engineering consideration for the three of the sprayer machine under experiment, it found that the main parameters affecting the operation of knapsack sprayer (No 1) are the amount of liquid discharge, the velocity of liquids introduced into the nozzle chamber and the nozzle opening radius. While, the parameters affecting air carrier sprayer are the surface tension and the pressure.

But for the spinning disc the parameter affecting spray distribution is the centrifugal speed of sprayer disc (Eq. 12)

Droplets size analyses and coverage efficiency:

Foliage coverage efficiency of each applicator was determined by measuring the spray deposits, (number of droplet per square centimeter and the volume median diameter).

The plants were divided into three levels: top; middle; and bottom to represent the higher, middle and lower leaves respectively, in the fashion used by Awady and Afifi (1976). Water sensitive paper cards were fixed on plants at straight radial lines on each level. The plants were treated with the different fungicides using the different applicator types. After the plant got dry, the cards were collected, the spray droplets were counted per square centimeter (No/cm^2), The volume median diameter (VMD) of each sprayer was calculated according to the following formula (Awady, 1977):

$$VMD = \left[\sum_{i=1}^{i=n} n_i X_i^3 \Big/ \sum_{i=1}^{i=n} n_i \right]^{1/3}$$

Where:-

n = Summation of number of droplets at each classification of droplet size class.

X = Droplet diameter for given class.

Statistical analysis procedure :

All the data were subjected to statistical analysis according to the procedures (ANOVA) adopted by Snedecor (1957). Means of treatments were compared by the Least Significant Differences test "L.S.D" at 5 % level of probability.

RESULTS AND DISCUSSION

Data in Tables (2 & 3) reveal a significant differences were found between either the fungicides or the types of sprayers concerning with disease severity, grain yield/m and 1000 kernel weight (kW). Good interaction is present between the tested fungicides and sprayer types.

Table 2: Interaction between three fungicides and three types of sprayers in controlling powdery mildew of wheat during 2003/2004 growing season at Gemmeiza Station.

Sprayer type	Fungicide	Reaction		Grain yield		1000 kW	
		Disease severity%	Efficacy %	/ m^2	Increase %	gm.	Increase %
H.V.	Sumi-8	11.66	85.42	0.813	53.10	43.26	36.16
	Tilt	20.00	75.00	0.759	42.93	42.28	33.08
	Eminent	8.33	89.58	0.824	55.17	43.68	37.48
Mean		13.33		0.798		43.07	
L.V.	Sumi-8	10.00	87.75	0.843	58.75	43.76	37.74
	Tilt	16.66	79.17	0.778	46.51	42.92	35.09
	Eminent	5.00	93.75	0.853	60.64	43.81	37.89
Mean		10.55		0.824		43.49	
U.L.V.	Sumi-8	50.00	37.50	0.595	12.05	37.85	19.13
	Tilt	60.00	25.00	0.562	5.83	35.79	12.65
	Eminent	50.00	37.50	0.588	10.73	37.29	17.37
Mean		53.33		0.581		36.97	
Control		80.00		0.531		31.77	
L.S.D. at 0.05	A	2.13		0.005		0.35	
	B	1.59		0.007		0.33	
	AXB	2.75		0.011		0.57	

The fungicide eminent (Tetraconazole) sprayed by either LV or HV sprayers gave the lowest powdery mildew diseases severity (5.00 , 8.33 %) in 2004 season and (3.00,5.00%) in 2005 season. Sumi-8 fungicide (Diniconazole) came in the second rank releasing (10.00, 11.66 %) in year 2004 and (5.00, 5.00 %) in the second year 2005. While the fungicide tilt (Propiconazole) showed the lowest efficacy in controlling powdery mildew with all the used sprayers . It could be noticed that disease severity increased with all the fungicides by using ULV sprayer, which ranged from 50-60%., consequently their efficacy were lower (25.00- 37.50 %) .

In another study ,Hussien, Mamdouha (1999), she stated that the best effective fungicides as foliar sprays to control barley powdery mildew were Cyproconazole and Triadimefon. Also, El-Salamony (2002) found that sumi- 8 (Diniconazole) was the best for controlling wheat powdery mildew under green-house condition. Lipps and Madden (1989) reported that spray timing of fungicides is mostly important especially when applied at the early stage of disease development but, one spray hasn't got a good effect and ensure protection during the adult stages.

Table 3: Interaction between three fungicides and three types of sprayers in controlling powdery mildew of wheat during 2004/2005 growing season at Gemmeiza Station.

Sprayer type	Fungicide	Reaction: Disease severity%	Reaction: Efficacy %	Grain yield: / m²	Grain yield: Increase %	1000 kW: gm.	1000 kW: Increase %
H.V.	Sumi-8	5.00	93.75	0.822	55.38	43.24	36.23
	Tilt	20.00	75.00	0.799	51,03	42.17	23.86
	Eminent	5.00	93.75	0.832	57.27	43.28	36.35
Mean		10.00		0.817		42.89	
L.V.	Sumi-8	5.00	93.75	0.825	55.95	43.59	37.33
	Tilt	11.66	85.42	0.800	51.22	42.03	32.41
	Eminent	3.00	96.25	0.842	95.16	43.84	38.12
Mean		6.54		0.822		43.15	
U.L.V.	Sumi-8	50.00	37.50	0.610	15.13	37.69	18.74
	Tilt	60.00	25.00	0.586	10.77	35.73	12.57
	Eminent	45.00	77.08	0.618	16.82	37.98	19.65
Mean		51.66		0.604		37.13	
Control		80.00		0.529		31.74	
L.S.D. at 0.05	A	1.51		0.007		0.29	
	B	0.81		0.005		0.25	
	A X B	1.41		0.008		0.44	

Significant interaction was found between the used sprayers in increasing the efficacy of the fungicides. The LV sprayer showed the lowest mean disease severity of powdery mildew (10.55% and 6.54%) followed by HV sprayer (13.33 % and 10.00 %) in the years 2004-2005, respectively. While the use of ULV sprayer gave the highest mean of disease severity (53.33 and 51.66 %) in the two years, consequently reduced the efficacy of the tested fungicides. These results indicate that using LV sprayer was more effective in controlling wheat powdery mildew of wheat followed by HV sprayer comparing with ULV sprayer. These results may be attributed to the ability of L.V and HV sprayers to move the leaves of wheat by its air power and arrive the fungicide to all parts of the plants consequently to the colonies of powdery mildew. This will be reflected on the increase of fungicide efficacy in controlling the disease. EL-Meseary and Abd-EL-Fattah (2005) reported that the knapsack sprayer (H.V.)was better than Mistblower sprayer (LV) for weed control in wheat crop. They attributed their results to the special properities of each sprayer. In contrast of these results, Ismail and Bader (2004) obtained different levels of efficacy when using three types of applicators i.e. ULV, LV and HV sprayers to control cucumber downy mildew by Ridomil plus. ULV applicator showed the highest disease control efficacy, followed by L.V applicator, while H.V applicator was the least in this respect. It could be attributed to the size of cucumber leaves and the small number of plants in the area unit .

The interaction between fungicides and sprayer types was reflected on the increase grain yield/m² and 1000 kernel weight. Spraying the fungicide eminent by LV gave the highest mean increase % of grain yield (0.824&

0.822 kg/m^2) and 1000 kernel weight (43.49 & 43.15 g) in the years 2004 and 2005 ,respectively. HV sprayer with the three fungicides came in the second rank releasing (0.798 & 0.817 kg/m^2) for grain yield and (43.07 & 42.89 gm) for 1000 kernel weight in the two seaseons ,respectively. ULV sprayer gave the lowest values of the two parameters with all the fungicides (0.581 & 0.604 Kg/ m^2) and (36.97& 37.13 gm) for grain yield/ m^2 and 1000 kernel weigh, respectively. It could be mentioned that approximately 2 percent of yield will be lost for every 1 percent of flag-leaf area infected by powdery mildew above 5 percent level (Small Grain Variety Report and In 2000 Alabama Pest Management Handbook) Chapter "Small Grain Insect, Disease and Weed Control Recommendation" .

Droplet size analyses of each applicator:

The data presented in (Table 4) indicated that the ULV applicator gave the highest number of droplets either on the upper; middle or on the lower leaves. It was manifested, that in all cases, the highest number of droplets was found on the upper leaves, this number decreased gradually on the middle and lower leaves; however this decreasing of the number of droplets differed from an applicator to another.

Table 4: Distributions of the spray suspension droplets per cm^2 and volume mean diameter (VMD).

Sprayer type	Number of droplets/cm^2 at the levels of plant			Mean of droplets/cm^2	(VMD) μm
	Top	Middle	Bottom		
HV	92	67	19	59	213
LV	186	143	102	144	174
ULV	253	198	138	196	92

In case of the ULV applicator, relatively smooth reduction in droplet number was noticed. Number of droplets reduced from 253 on the upper leaves to 198 on the middle leaves representing 21.5% reduction. The number of droplets on the lower leaves decreased to 138 droplets which representing 45.5% reduction.

In case of LV applicator the decrease of the droplets number was more obvious; since the droplets number ranged from 186 on the upper leaves to 143 on the middle leaves representing 23.1% reduction, and decreased to 102 droplets on the lower leaves representing 45.2% reduction. In the case of HV applicator, this decrease was drastically; since the droplets number decreased from 92 on the upper leaves to 67 on the middle leaves representing 27.2% and decreased to 19 droplets on the lower leaves representing 79.3% reduction.

From the same table, it can be noticed that the least VMD was obtained using the ULV applicator (92 μm), followed by LV applicator with (174 μm). The largest droplets (213 μm) resulted from HV applicator. In general, data agree with finding of Awady and Afifi (1976).

The efficacy of the different tested fungicides was greatly affected with the fungicides suspension amount per fed. Decreasing the fungicides suspension amount resulted in clear reduction in the fungicides efficacy. However this reduction depended upon the applicator type. This reduction was great in the case of HV applicator, intermediate in case of LV applicator and low in case of ULV applicator. Grayson et al. (1996) attributed the enhanced performance of fungicides by low volume applicator to the higher spray retention with spray drop coalescence and lower run-off. On the other hand, the number and size of the spray droplets per cm^2 reaching the crop or ground play their part in determining the biological efficacy of the treatment in addition to the efficacy of the fungicide (Anonymous. 1985). Similar data were obtained be Moustafa and Ismail (2003).

The amount of the indicator captured on the strips was high when HV applicator was used compared with LV and ULV. This higher amount may be due to the higher ability of the large droplets produced by the HV applicator to run off, resulting in little amount of indicator solution captured on the plant foliage and increased amount of the indicator that reached the soil. Brunskill (1956) discussed such suggestion; he mentioned that droplets, which reach a surface, might not be retained on it. He added that droplets which strike a surface become flattened, but the kinetic energy is such that the droplets then retract and bounce away. Droplets below certain size (< 150 µm) have insufficient kinetic energy to overcome the surface energy and viscous changes and cannot bounce; conversely, very large droplets have so much kinetic energy.

The potential for an LV applicator to improve the penetration and deposition of fungicides material within crop canopies lies within the sprayer turbulence and mass transfer characteristics.

Spray using HV applicator depend on the pressure of the handle pump. Also, the LV applicator works using air pressure with air velocity about 43.7 m/sec. The two sprayers produced large droplets compared with the ULV sprayer. Droplets of HV and LV penetrated the heavy growth plants with drag force by pressure and air velocity respectively. Meanwhile, spray using ULV applicator which works with centrifugal force produced very small fine droplets that have low speed. Therefore, it's ability to interfuse the heavy growth plants will not occur. Generally, droplet size had significant effect on deposition efficiency; however. It is important to note that its effect could be influenced by droplet velocity, spray quantity, leaf surface properties.

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التفاعل بين بعض المبيدات الفطرية وآلات الرش فى مقاومة مرض البياض الدقيقى فى القمح

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الهدف من هذا البحث هو دراسة التفاعل بين ثلاثة من المبيدات الفطرية الجهازية تنتمي لمجموعة الترايازول تطبق مع ثلاثة أنواع من آلات الرش ذات القطرات الكبيرة والقطرات الصغيرة والقطرات المتناهية في الصغر فى مقاومة مرض البياض الدقيقى في القمح. تم تنفيذ هذه الدراسة بمحطة البحوث الزراعية بالجميزة موسمى ٢٠٠٤/٢٠٠٥ .

لقد أعطت المبيدات الفطرية إمننت (تتراكونازول) ، سومى – ايت (دينيكونازول) أعلى قيم من الكفاءة لمقاومة المرض عند استخدام آلات الرش ذات القطرات الصغيرة (٩٣,٧٥ ، ٩٦,٢٥ % ، ٨٧,٧٥ ، ٩٣,٧٥%) أو آلة الرش ذات القطرات الكبيرة (٨٩,٥٨ ، ٩٣,٧٥ %، ٨٥,٤٢ ، ٩٣,٧٥%) في عامي ٢٠٠٤ – ٢٠٠٥ على التوالي ، بينما أظهر المبيد تلت (بربيكونازول) أقل قيمة للكفاءة مع كل آلات الرش المستخدمة.

وجد أن التفاعل كان جيدا ومعنويا بين المبيدات وآلات الرش حيث أعطت آلة الرش ذات القطرات الصغيرة ، آلة الرش ذات القطرات الكبيرة أقل متوسط لشدة الإصابة بالمرض (١٠,٥٥ ، ٦,٥٤ % و ١٣,٣٣ ، ١٠,٠٠ %) على التوالي في عامي ٢٠٠٤ – ٢٠٠٥ . بينما أظهرت الرشاشة ذات القطرات المتناهية الصغر أعلى متوسط لشدة الإصابة بالمرض (٥٣,٣٣ ، ٥١,٦٦ %) مقارنة بمعاملة الكنترول.

أوضحت الاختبارات المعملية أن الرشاشة (ULV) التي تنتج قطرات صغيرة جدا (٢٠٤ قطرة/سم٢ لقطر ٥٦,٦٦ ميكروميتر) والرشاشة ذات القطرات الصغيرة (١٨٣ قطرة/سم٢ لقطر ١٤٦ ميكروميتر) بينما الرشاشة ذات القطرات الكبيرة ينتج قطرات كبيرة (٩٨ قطرة/سم٢ لقطر ١٨٩ ميكروميتر).

يعتمد الرش بالرشاشة HV على ضغط المضخة اليدوية، والرشاشة LV على ضغط الهواء بسرعة حوالى ٤٣,٧ م/ث. وقطر القطرات الناتجة من الرشاشتين HV, LV أكبر من الرشاشة ULV، لذا تتخلل القطيرات الناتجة النباتات ذو النمو الكثيف بواسطة قوة الدفع بالضغط وسرعة الهواء على الترتيب. بينما الرش بالرشاشة ULV التى تعمل بقوة الطرد المركزى تنتج قطيرات صغيرة جداً ذات قوة دفع صغيرة لا تتخلل داخل النباتات الكثيفة. هذه النتائج ألقت الضوء على أهمية اختيار نوع الرشاشة المناسب لنوع المحصول. النباتات ذات النمو الكثيف مثال القمح (عدد الأشطاء ٣٠٠ – ٣٥٠ /م٢) يجب أن ترش بآلة لها قوة دفع للقطرات (HV – LV) بينما المحاصيل ذات الأوراق العريضة مثال القرعيات يجب أن ترش بآلة ذات قطرات متناهية الصغر (ULV) لمقاومة أمراض النبات.