THE USE OF HELICOPTER FOR CONTROLLING WEEDS OF SUGAR CANE

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Abstract

One of the major factors influencing the yield of sugar cane is weeds. Some trials for controlling weeds by herbicides in Egypt were conducted during the last ten years with the use of ground equipment and fixed -wing aircraft.

The current work presents a first trial to utilize the advantages of the helicopter in such purpose using low volume rate of application. The mean size and number of droplets deposited from the herbicide Gesapax combi 80 WP on weeds were 322 μm and 127 droplets/cm^2.

Bioassay results indicated that all broad-leaved weeds and grasses were satisfactorily controlled. The mean productivity and rate of performance of the tested helicopter "Mi-2" were 120 f./h and 480 f./day successsively.

INTRODUCTION

In 1990, about eleven million tons of sugar cane were gathered in Egypt from 275 thousand feddans concentrated in Menya, Quena and Aswan governorates. More than half of the yield could be lost due to the severe infestation with seeds (Brandura, 1977).

Ten years ago, the authors conducted some successful trials to control weeds of sugar cane by Gesapax Combi herbicide with the use of Antonov (AN-2), plane and lwo-voulume rate of 30 L/f. Nour and Allam (1988) tested the same herbicide with

others for similar purpose by means of a knapsack sprayer at 100-150 l./ f. An increase of 14% in yield was achieved due to good control results against the common sugar can weeds. They stated that hand weeding becomes ineffective and costly because of wide spread of weeds , shortage of labour and successive increase of wages.

Generally, for chemical control of sugar cane weeds, the suggested size and number of droplets should be around 400 micrometers (VMD) and 20 droplets/cm^2, respectively (Anonymous , 1977).

Ripper and Tudor (1947) , Isler and Maksymiuk (1961), Johnstone (1978) Shrodzki *et al.*, (1978) , Witkowski (1978), Mochida *et al.*, (1981), and Amsden (1986) assured the superiority of helicopter in comparison with fixed-wing planes with regard to spray quality , coverage and techno-operational aspects. Therefore, it seems that aerial application could be introduced as a useful technique in chemical control of sugar cane weeds .

The present work evaluates low-volume spraying with a herbicide by means of a medium-size helicopter for controlling common weeds of sugar cane in Upper Egypt. Good control results were obtained against all broad leaved weeds and grasses.

MATERIALS AND METHODS

A helicopter "Mi-2" was calibrated at the airstrip of Edga/ Mallawi district to spray 40 liters of spectrum of droplets , i.e. VMD = 2000-450 micrometers and N/ cm^2 not less than 40 droplets, at a flight altitude ranged between 1-2 meters.

Techno-operational data of the helicopter and its spraying system and the applied spray parameters are recorded in /Table 1. A schematic drawing of Mi-2 helicopter is demonstrated in Fig. 1. Field tests were carried out at Quaiandoul, Sheikh Ali plot, Mallawi district, Menya governorate, on the beginning of June 1991. The sprayed sugar cane (Variety 68/ 88 and 54) was planted in spring of this year and would be harvested during the spring of 1992.

Table 1. Techno-operational data of Mi-2 helicopter and its spraying system and the used spray parameters.

Item	Value	Remarks
Horse power , HP	2 x 400	Turbine engines
Weight , kg	3550	Starting
Plain rotor dia , m	14.56	
Max. speed, Km/h	180	Cruising
Max. speed, Km/h	155	near ground
Econ. speed, Km./h	105	
Operational speed, Km/h	60	during test ± 3km/h
Rate of application, l./f.	40	
Runwidth, m	30	H = 1-2 m
Boom length, m	14-30	Russian construction
Nozzle type	Swiril	hollow cone
Nr. of nozzles	(68+20) 88	various spacings
Flow rate, l./min.	285.7	mean rate
Productivity,f./h	120	Normal operation
Rate of performance f./day	480	for one pilot

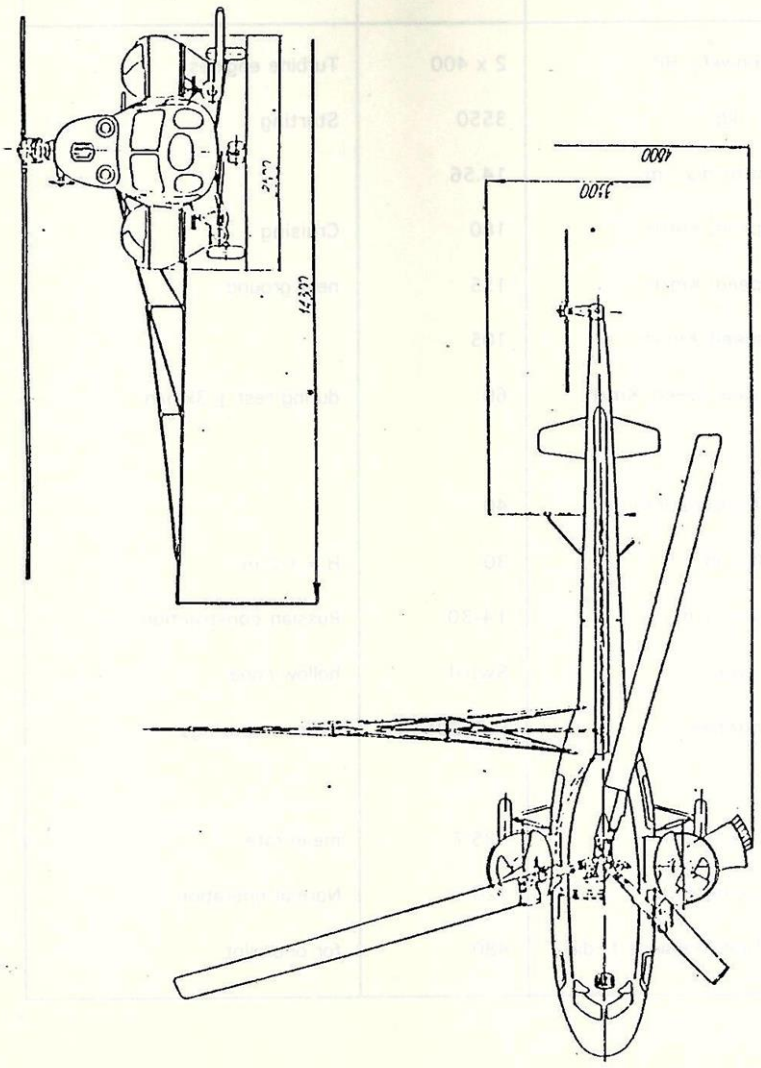

Fig. 1. A schematic drawing of Mi-2 helicopter.

In order to assess the efficacy of weed control, weeds of the treated field were surveyed before and after application by the staff of the Sugar Cane Research Station of Mallawi/Menya governorate, under the supervision of the Sugar Cane Research Institute, Agricultural Research Centre, Ministry of Agriculture.

The used herbicide "Gesapax Combi 80 WP" is recommended against sugar cane weeds which appear after planting or after cutting (ratoon cane) , at the dosage of 3 l./f. Spray quality of the swath (Number and size of droplets) was determined under airstrip and field conditions. Spray was collected on strips of a special paper sensitive for aqueous solutions.

The airstrip's sampling line consisted of fifty wire holders (30 cm height) with one meter spacing between each two holders. One-shape paper was fixed on the holder against wind direction and in the meantime the sampling-line was mounted perpendicular to wind direction.

In the field , three sensitive papers were fixed on the upper, middle and lower levels of the grown weeds. Ninety weeds in a straight line, were furnished with those papers at a distance of about one meter between each two weeds. To a great extent, this line was perpendicular to both wind and flight directions. Measurements of size / number of spots were carried out by means of scaled monocular. All necessary corrections and calculations connected with such technique of measurement and determination were taken in order to achieve the actual size of droplets expressed in Volume Mean Diameter and its numbers on one square centimeter (Anonymous, 1978).

Airstrip's meteorological conditions were : air temp. 28. 2^{o}C , Relative humidity 61.6% and wind velocity 1.3m/sec. During aerial spraying on sugar cane field , such conditions were 26.0^{o}C, 68.0% an 0.8 m/sec., respectively. The mean values of droplet data of three replicates obtained under airstrip and field conditions are demonstrated graphically in Fig.2.

RESULTS AND DISCUSSION

The used helicopter is a medium-size aircraft (weight/power) with a suffi-

cient downwash capable for good distribution of spray on the foliage of treated weeds, which was indicated clearly in swath of spray deposited on weeds under field conditions.

The obtained spectrum of droplets was more rich in comparison to the airstrip spectrum (Fig. 2) . The average size and number of droplets collected under field conditions were 322.4 μm and 127.1 droplets /cm^2 increasing to 10% and 14%, respectively than the spectrum collected at the airstrip due to variation of meteorological conditions. Such satisfactory coverage of herbicide was reflected on the final results of weed control, especially when the spraying application was done on the proper timing with the use of a tested herbicide (Nour *et al.*, 1988).

Bioassay result indicated that all broad-leaved weeds and grasses including *Panicum coloratum* were controlled completely. However, the influence on old leaves of *Portulaca aleraceae* was classified as medium result.

From the operational point of view, the practical productivity and rate of performance of the helicopter"Mi-2" ranged between 110-130 f./h and 465- 495 f./ day with and average of 120 f./h and 480 f./day, successively, under technooperational condititions of Table 1 and topography of the experimental area.

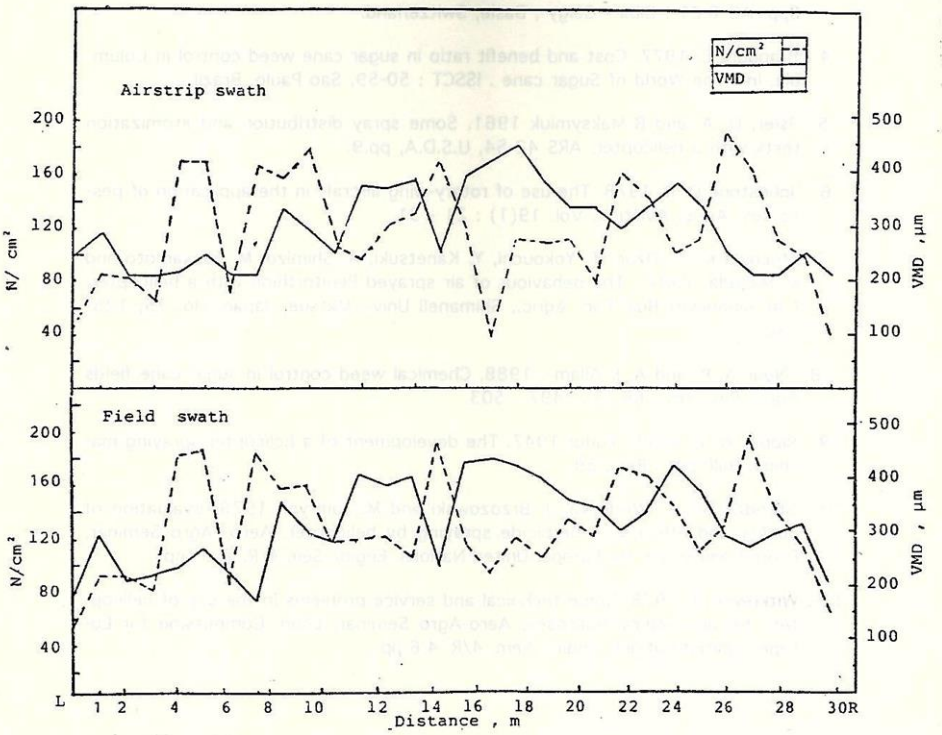

Fig. 2. Configuration and structure of the spray pattern obtained by Mi-2 helicopter under airstrip field condition.

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إستخدام الطائرات العمودية في مكافحة حشائش محصول قصب السكر

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تعتبر آفات الحشائش من أهم العوامل الرئيسية المحددة لكمية محصول قصب السكر ولذلك إجريت في العشر سنوات الماضية سلسة من التجارب لمكافحتها بمبيدات الحشائش من خلال استعمال المعدات الأرضيه للرش والطائرات ثابته الجناح.

تعتبر هذه التجربة الأول من نوعها التي تحقق الاستفاده من منافع ومزايا الطائرات العمودية باستخدام معدلات حجوم الرش القليلة. استخدم في هذه التجربة مبيد الحشائش الجيساباكس كومبي وكان متوسط أحجام وأعداد القطيرات الساقطة علي الحشائش ٣٢٢ ميكرون ، ١٢٧ قطرة/ سم٢ علي التوالي تحت ظروف التجربة.

كما اوضحت النتائج البيولوجية عن استخدام معايير الرش المضبوطة بالطائرات العمودية القضاء الكامل علي كل الحشائش الحوليه عريضة الأوراق والحولية النجيلية (القصبه)وكانت نسبه التأثير علي الأوراق القديمه لحشيشة الرجله متوسطة.

كان متوسط الأنتاجية ومعدل الأداء للطائرة العمودية المختبرة "مي٢" ١٢٠ فدان / ساعه ، ٤٨٠ فدان / يوم علي التوالي.