Application of Harvest Aids in Cotton-winter wheat Double Cropping System of China

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INTRODUCTION

Cotton is one of the most important industrial crops of the Huanghuaihai Region in China, where cotton-winter wheat double cropping system is the main farming system. It is critical to harvesting the cotton in the relative short time for the planting of following winter-wheat. Normally, cotton is picked by hand in this region. However, changes in social economic condition have led to a shortage of workers to pick the cotton and in turn, most producers intend to introduce mechanized harvesting. Mechanized harvesting of cotton requires the application of harvest-facilitating defoliants. Developing efficient and safe harvest aid products and using technology are essential for this region.

OBJECTIVE

To determine the effects of different harvest aids on defoliation, boll opening, seed cotton yield, fiber quality and seed quality in Huanghuaihai Cotton Region.

MATERIALS & METHODS

Experiments were conducted at the Guoxin Research Farm in Hejian County, Hebei province of China. Cotton was planted on 26 Apr. 2009 (cv. ND 8), and 29 Apr. 2010 (cv. GX 3 and cv. GX 8). Application rates of harvest aids are shown in Table 1. All treatments were applied at 50±5% open bolls in late September, and harvested at 14 days after treatment for the first time before/in mid-October, suitable for planting winter-wheat.

Table 1 Application rates of harvest-aid treatments

No.	Treatment	ai (kg ha^{-1})
T_1	Non-treatment	
T_2	Ethephon	0.72
T_3	Dimethipin	0.34
T_4	Thidizauron and Diuron	0.08
T_5	Thidizauron	0.15
T_6	Dimethipin + Ethephon	0.27+0.60
T_7	Thidizauron and Diuron + Ethephon	0.08+0.60
T_8	Thidizauron + Ethephon	0.15+0.60

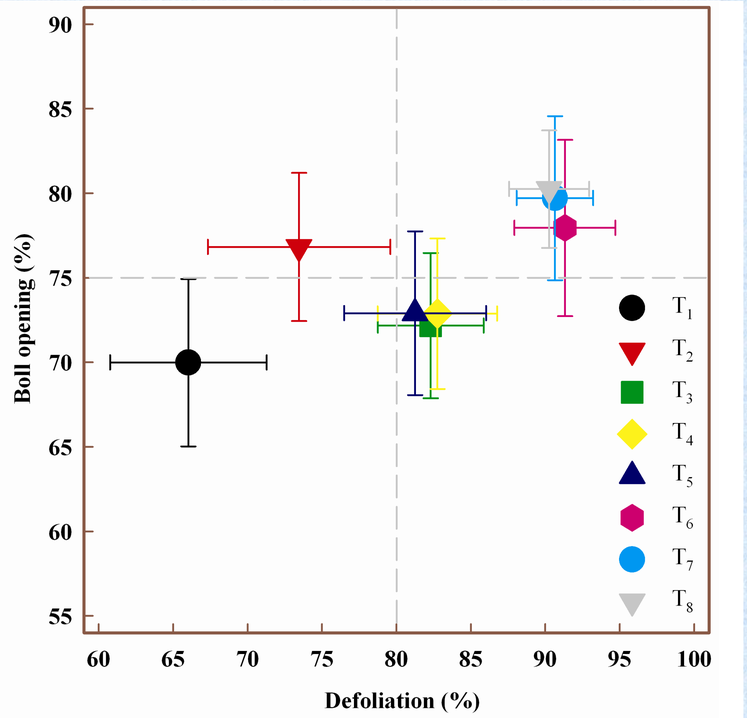

Fig.1 Defoliation and Boll opening of harvest-aid treatments (means of three cultivars)

Table 2 Seed cotton yield of harvest-aid treatments for three cultivars

Treatment	1st harvest yield (kg ha^{-1})			Total yield (kg ha^{-1})			1st harvest (%)		
	ND 8	GX 3	GX 8	ND 8	GX 3	GX 8	ND 8	GX 3	GX 8
T_1	1889.0	2239.1	2347.3	2747.8	2965.0	3096.7	69.0	75.7	76.1
T_2	2096.2	2562.1	2725.5	2609.6	2990.1	3350.6	80.5	85.8	81.4
T_3	1969.8	2406.6	2460.5	2554.0	2960.5	3013.2	77.0	81.5	81.9
T_4	2061.5	2568.7	2593.8	2760.1	3039.5	3115.2	74.8	84.6	83.3
T_5	2018.8	2598.4	2643.2	2691.4	3070.8	3237.0	75.0	84.5	81.6
T_6	2108.0	2631.3	2717.3	2694.5	3108.6	3250.2	78.2	85.0	83.7
T_7	2282.5	2725.1	2836.6	2721.3	3144.9	3328.4	83.9	86.6	85.4
T_8	2312.6	2680.7	2926.3	2790.3	3080.7	3367.1	82.8	87.3	86.9
$LSD_{0.05}$	362.9	422.6	436.7	NS	NS	NS	13.5	7.1	4.3
C.V.(%)	11.4	10.2	10.4	6.2	9.9	9.8	10.0	5.7	4.5

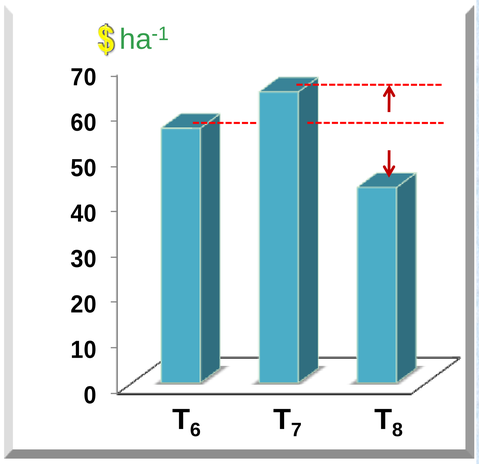

Fig.2 Defoliant costs of T_6, T_7 and T_8

T_1: Non-treatment

T_2: Ethephon

T_5: Thidizauron

T_8: Thidizauron + Ethephon

RESULTS & DISCUSSION

The results showed that ethephon had greater boll opening effect but poor defoliation effect, while three defoliants (T_3, T_4 and T_5) had opposite effects. Greater than 90% abscission and 78~80% boll opening were observed at tank mixes of ethephon and three defoliants, respectively. No differences of total seed cotton yield among all treatments were observed, but 83~87% of first harvest percentage was recorded for T_7 and T_8. The upper boll weights of T_3, T_4 and T_5 were lower than those in control (T_1), while no differences among the treatment means for ginning percentage, 100-seed weight, and seed germination percentage (data not shown). This study showed that tank mixes of ethephon and defoliants could be used for defoliation and boll opening of cotton with higher yield potential and less seed quality reduction, especially T_8 due to lower cost.

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