

# The effects of sowing date on plant survive rate and seeds yield of winter rapeseed (*Brassica rapa*) in Northwest China\*

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## Abstract

The effects of different sowing dates on over-wintering rate, maturity, yield and oil content of winter rapeseed (*B. rapa*) were studied. When the seeds were sown on 24<sup>th</sup> of August, it gave an over-wintering rate of 85.54%, and seeds yield of 3501.75 kg/hm<sup>2</sup> and oil content in seeds of 43.22%. While the sowing was carried on 14<sup>th</sup> of September, it gave an over-wintering rate of 5.29% with a late maturity, the seed yield was 133.35 kg/hm<sup>2</sup> and the oil content was 37.47%. It suggests that the sowing date had a significant effect on plant survive rate over winter time and the seed yield in winter rapeseed in north-west China.

**Key words:** *B. rapa*, Sowing date, Over-wintering rate, Seed yield, Oil content

## Introduction

Sowing date has significant effects on the growth and yield of winter rapeseed. It is one of essential factors to guarantee winter rapeseed surviving through the cold winter to obtain a reasonable and stable yield. Sowing date is extremely critical for growing winter rapeseed in cold winter and dry land in North-west China because of the shorter optimal growth period for rapeseed (Zhang et al., 2003). In this region plant growth and seed yield of rapeseed are largely depending on sowing date. A suitable sowing date could ensure a longer growth period for rapeseed plants to accumulate more dry matters before winter. This paper reported the results of studying on the effects of different sowing date on plant growth and seed yield of rapeseed in the arid and cold region in North-west China.

## Materials and methods

A *Brassica rapa* variety MXW-1 was used in this research which was provided by Agronomy College, Gansu Agriculture University. The experiment field located in Nanchuan village (Liuchuan, Jingyuan County, Gansu Province, Latitude 36°34', elevation 1500m, temperature in January -7.7°C, annual average temperature 8.8°C, frost-free days 185 days, annual precipitation 240mm.). Trial design were four sowing date: August 14<sup>th</sup>, August 24<sup>th</sup>, September 4<sup>th</sup> (CK), September 14<sup>th</sup> with three randomly replications. The plot's area was 15 m<sup>2</sup> (5m×3m) with a seeding space of 10cm and row space of 20cm. After the wheat harvested plots were fertilized with farm manure (60000kg/hm<sup>2</sup>) and phosphoric fertilizer ((NH<sub>4</sub>)<sub>2</sub>HPO<sub>4</sub>, 225kg/hm<sup>2</sup>). Over-wintering rate of rapeseed plants, yield per plot were recorded and oil content in seeds was determined by Soxhlet's method.

## Results

Table 1 showed that survive rate of rapeseed plants was dramatic effect by sowing date. Delayed sowing resulted in a weak plant growth and most of them couldn't survive in winter. Plants survive rate of sowing on August 14<sup>th</sup>, August 24<sup>th</sup> was 85.54%, 81.81% respectively; while that of sowing on September 4<sup>th</sup>, September 14<sup>th</sup> only 39.09%, 5.29%(table 1). These data demonstrated that the suitable sowing date in this area might be around the third week of August.

**Table 1 Effect of sowing date on over winter survivability rate**

Sowing date(d/m)	14 <sup>th</sup> /8	24 <sup>th</sup> /8	4 <sup>th</sup> /9	14 <sup>th</sup> /9
Before winter (plants/m <sup>2</sup> )	57.67	58.67	58.00	63.00
After winter (plants/m <sup>2</sup> )	49.33	48.00	22.67	3.33
Survival rate (%)	85.54	81.81	39.09	5.29
Compare to CK (±%)	46.45	4272	---	-33.8

Table 2 showed that the maturity of rapeseed was delayed by late sowing. When sowing on August 14<sup>th</sup>, the maturity was 16 days late than CK. When sowing on August 24<sup>th</sup>, it was 6 days late than CK. While sowing on September 14<sup>th</sup>, the maturity was 8 days earlier than CK. The duration of flowering of sowing on August 14<sup>th</sup>, August 24 was 5 days, shorter than CK.

Sowing time had significant effect on seed yield of winter rapeseed (table 3). Seed yield harvested 3401.70 kg/hm<sup>2</sup>, 128.27% higher over the CK when sowing on August 14<sup>th</sup>. But the yield was 133.35 kg/hm<sup>2</sup>, 93.31% lower than CK when sowing on September 14<sup>th</sup>. It indicates that suitable sowing date was essential to yielding high for winter rapeseed.

**Table 2 The effect of sowing date on growth period of winter rapeseed**

Sowing date (m/d)	Start of flowering (m/d)	End of flowering (m/d)	Maturity(m/d)	Duration of flowering (d)	Growth period (d)
8/14	4/7	5/2	6/2	25	286
8/24	4/7	5/2	6/2	25	277
9/4	4/7	5/7	6/7	30	270
9/14	4/7	5/10	6/9	33	262

**Table 3 The effect of sowing date on yield of winter rapeseed**

Sowing date (m/d)	Seed weight (kg/plot)	Yield (kg/ hm <sup>2</sup> )	Over CK (±%)
8/14	5.25	3501.75	128.2 <sup>Aa</sup>
8/24	5.10	3401.70	122.0 <sup>Aa</sup>
9/4	2.30	1534.05	0.00 <sup>Bb</sup>
9/14	0.20	133.35	-91.31 <sup>Cc</sup>

Late sowing reduced the oil content in seed. In this experiment, the highest oil content, 43.22%, obtained when sowed on August 14<sup>th</sup> It was 2.33% higher than CK. The lowest oil content (37.47%) was given by sowing on September 14<sup>th</sup> with 3.42% lower than CK..

**Table 5 The effect of sowing date on oil content of winter rapeseed**

Sowing date (m/d)	Replication			Total (%)	Average (%)	Over CK (±%)
	I	II	III			
8/14	43.02	43.65	43.0	129.67	43.22	2.33
8/24	42.44	41.57	41.39	125.4	41.80	0.91
9/4	42.34	41.39	38.93	122.66	40.89	0.00
9/14	38.89	35.20	38.32	112.41	37.47	-3.42

## Discussion and conclusions

Sowing time of winter rapeseed has significant influence on plant survive rate, growth period, seeds yield and oil content (Zhang et al., 2005; Liao et al., 2001; Yuan et al., 2003). According to present results, the different sowing date resulted in various winter survive rate of plants from -33.8% to 46.45% compare to CK. As a results the seeds yield increased from -91.31% to 128.27%. When seed sow on August 14<sup>th</sup> gave the highest winter survive rate (85.54%) of the plants and highest seeds yield (3501.75kg/hm<sup>2</sup>). Obviously, favorable sowing time could let winter rapeseed plant grow well before winter and accumulate enough dry matters to survive over-winter. Thus, it could enhance seeds yield increasing.

Although reasonable sowing date could improve the plants survive rate over-winter and seeds yield of winter rapeseed, other factors which might affect plant growth and seeds yield of winter rapeseed in this area, such as fertilizer application and moisture in soil *et al.* require to study further.

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