Prospects of rapeseed production in warm and cold dry-land areas of Iran

S. S. Pourdad

Dry-land Agricultural Research Institute (DARI), Oilseed Programme, Sararood,P.O.Box. 67145-1164 Kermanshah, Iran
Email: sspourdad@yahoo.com

Abstract

About 80% of the need of edible oil of the country is met through imports. There are now efforts to create and develop area for important oilseed crops with emphasis on rapeseed. Almost 60 % of the cultivated area in the country is rain-fed, therefore there is planning to bring more area in the dry-land region under suitable new oilseed crops. Elaborate research in the last five years was conducted at dry land research stations of the country. The stations where oilseed crop research was conducted are located at Sararood, Maragheh, Gachsaran, Sanandaj, Ilam and Shirvan. Results showed that end of November was the best sowing date for rapeseed in warm as well as semi-cold dry-land areas. Spring type rapeseed hybrids from Australia and Canada perform better in warm climates, which prevails in the North and South of Iran. Results revealed that in some areas like Sararood mustard varieties from Canada produce economical yield, more than rapeseed and surprisingly as cold tolerant as rapeseed winter type. Generally in production of yield rapeseed winter type are the best followed by mustard, spring type rapeseed and rapa varieties in rainfed conditions. Results showed that at lands receiving up to 400 mm rain during the season, highest yield of 2.1 t/ha was obtained with 50 kg N and 15 kg P/ha.

There was no difference between the yield of zero doze (1371.1 kg/ha) to 20 kg/ha (1371.5). Sulphur application should be based on the effective response in the area. Based on results it is recommended that in semi-cold areas 10 kg/ha seed may be used to cover the risks of cold temperatures and late rains. In warmer areas 6 kg/ha may be adequate. Results have demonstrated that early season weed control in rapeseed is critical in minimizing yield loss due to weeds. Competition studies have shown that if rapeseed are maintained free of weeds till the stem elongation stage after sowing, the weed seedlings which emerge later do not cause significant yield reduction.

Key words: Oilseed rape, *Brassica napus*, dry-lands

Introduction

Iran has around 15.3 m ha cultivated land, 9.5 m ha of which is rain-fed, rest of the area is irrigated from various water sources (Sadri and Binai).Cereals (wheat and barley) and pulses (chickpea and lentil)are the main crops in drylands. Studies showed that in drylands of Iran first effective rain has been occurred from last week of Oct. to last week of Nov.(Talliee and Pourdad 2002). Rapeseed is a new crop for the Islamic Republic of Iran, few years ago there was no commercial area under rapeseed and mustard in the country. Since country is short of edible oil, it depends on imports for various edidle oil for local consumption, it was therefore hought expedient to introduce rapeseed crop in the country.In 1998 there was no commercial cultivation of rapeseed in Iran while by 2006 almost 115,000 ha were cultivated in irrigated and rain-fed warm and semi-cold areas. The drylands of Iran, presently growing cereals and pulses, can accommodate additional crop of rapeseed in rotation. Rapeseed and mustard can also be used for diversification in dry as well as irrigated areas.

The rainfed areas of Iran roughly has got three types of climates. Very cold where frost days are around 120 during growing season, can grow cold hardy rapeseed types or short duration spring and summer forms can be raised from early spring i.e February to May, for these recommendations to become firm a couple of years site specefic agronomic research is needed.

In the areas with less than 100 frost days it will be possible to grow winter and spring forms of oilrapes cultivars; for cultivar selection elaborate variety evaluation mutilocation tests are needed for few seasons.

The third type of areas growing rapeseed are the warmer areas where it is possible to grow spring types in winter with the beginning of rainfall such as Guchsaran, Ilam and Sur Pul Zahab areas, in these areas varietal selection and production research is in progress.

More than 60 % of the cultivated area in Iran is rain fed, 40- 50 % cultivated area remains fallow annually in rotation. Some of the fallow can be replaced with these new crops to help alleviate the edible oil deficiency to some extent. Need to introduce rapeseed-mustard into the farming systems of the region is given by ICARDA (Beg 1994).

Materials and methods

Research on oilseed crops started from 1997 but elaborate research in the last five years was conducted at dry land research stations of the country. The stations where oilseed crop research was conducted are located at (1) Sararood in the mid west at the foot hills of zargos mountains, semi-cols region (2) Maragheh in the north-west, cold region (3) Gachsaran, a warm area in the south (4) Sanandaj in mid west, cold to semi-cols region (5) Ilam in extreme mid west, which has semi cold and warm area (6) Shirvan in the north-east, mostly semi cold. Pioneer rapeseed-mustard research was carried out at Sararood

in the fall seasons, these trials continued till current year.

Results and Discussion

Variety and date of planting: results showed that rapeseed winter type hybrids from European countries produce reasonable yield in semi-cold areas like Sararood, where winter temperatures below 5°C starts by end of November and there are around 85 frost events, further in this type of climate when rapeseed is planted by mid to end of October-late planting is due to late rains- then by the time low temperature regime sets in the crop is in small rosette stage, which stage is almost resistant to low temperatures up to almost -20°C, this is our observations as in literature it is stated that rapeseed can withstand -8 °C. We also found that spring type rapeseed hybrids from Australia and Canada perform better in warm climates, which prevails in the North and South of Iran and also is prevalent at other places like in Sarpulzahab in Kermanshah, Pudukhtar in Lurestan, and Izeh in Khoseztan etc.

It has also been observed that the oil content of the seed in our climate, which is colder during vegetative growth and real hot at maturity, is much higher than obtained else where, oil content is always around 50 % in all the varieties.

Results revealed that mustard varieties from Canada produce economical yield, more than rapeseed and surprisingly as cold tolerant as rapeseed winter type (table 1). Cutlass is a dull yellow seeded, condiment variety grown on about 100,000 ha in Canada (Downey, Rimmer 1993), Differences between *B. rapa* and *B. napus* agronomic characters in this study mostly reported in literatures (Thomas 1984). Compared to rapeseed, mustard is taller, more resistance to lodging and shattering and more tolerant to drought and heat (Rashid et al. 2002). In warmer areas its yield is comparable to high yielding spring type rapeseed. This information can be used when double low mustard varieties are available for commercial use.

Based on five years varieties evaluation results we have selected 10 winter type rapeseed, 10 spring type rapeseed and three mustard varieties for general cultivation in rainfall areas. In production of yield rapeseed winter type are the best followed by mustard, spring type rapeseed and rapa varieties in the order written.

We are also breeding our own varieties, in field as well as in plastic house. In 3-4 years we may be producing varieties from our breeding programme.

Fertilization: Some observations about fertilization were:

Nitrogen**:** Results showed that at lands receiving up to 400 mm rain during the season, small dozes of nitrogen say 30-40 kg/ha increase yield, yield with higher dozes reduces. This is usually the trend in nitrogen application performance when the rains at vegetative growth period are not sufficient. In any new area recommendation for fertilization should be based on research results.

Phosphorus**:** The application of phosphorus increased the yield from 1213.1 kg/ha with zero phosphorus to 1503.6 kg/ha with 30 kg P/ha.

Sulphur**:** There was no difference between the yield of zero doze (1371.1 kg/ha) to 20 kg/ha (1371.5). Thus this small doze of sulphur is ineffective. Sulphur application should be based on the effective response in trials in the area.

Interactions**:** Highest yield of 2.1 t/ha was obtained with 50 kg N and 15 kg P/ha.

Table 1. Performance of exotic rapeseed and mustard germplasm at Sararood.

Cultivars	DM	S/p	P/P	PH (cm)	TGK (g)	Yield g/3 m^2
Brassica napus						
1. Elect	241	22	116	62	2.88	400
2. Excell	241	21	80	68	2.30	590
3. Westar	244	15	48	87	3.86	320
4. Bilenda	251	21	107	103	3.03	630
5. Midus	241	19	85	99	4.10	590
6. Golden	241	22	47	75	3.72	370
Average	243.2	20	80.5	82.3	3.32	483.3
Brassica rapa						
1. Torch	243	15	63	88	2.12	290
2. Parkland	242	23	115	98	2.78	280
3. Tobin	243	21	80	68	2.30	590
Average	242.7	19.7	86	84.7	2.4	386.7
Brassica juncea						
1. Lethbridge	249	15	114	118	2.98	800
2. Landrace	249	17	91	96	2.42	730
3. Vulkan	249	16	151	128	2.46	1290
4. Cutlass	249	14	109	122	2.44	850
Average	249	15.5	116.3	116	2.57	917.5

DM= Days to maturity, S/p= seeds per pod, P/p=Pods per plant, PH=Plant Height, T.G.W=Thousand Grain Weight,

Seed rates: results showed that the yield from 6-16 kg/ha seed produce similar yields. It was therefore recommended that in semi-cold areas 10 kg/ha seed may be used to cover the risks of cold temperatures and late rains. In warmer areas 6 kg/ha may be adequate (Table2).

Weeds: In rapeseed cultivation, in trial as well as in commercial crop we have found that weed control is very essential. There are abundance of broad leaf weeds and grasses. More over rapeseed is planted on land which is under wheat the previous season so there are abundance of wheat volunteer, without adequate weed control the yield as well as quality of rapeseed produced deteriorates. This aspect in colza cultivation needs special care. Weed scientist should come up with integrated control of weeds in rapeseed crop. It has been recorded that weed control can only benefit the crop if it is carried out pre-plant or post-plant when the weeds and the crop is just in 2-3 leave stage (Table 3). Research has demonstrated that early season weed control in rapeseed is critical in minimizing yield loss due to weeds. Competition studies have shown that if rapeseed are maintained free of weeds till the stem elongation stage after sowing, the weed seedlings which emerge later do not cause significant yield reduction.

Table 2.Rapeseed and mustard variety average yield with different seed rate.

No	Seed rate Kg/ha	P/P	TGK (g)	P/MB	LB	PH (cm)	S/p	P/m	Yield Kg/ha
1	6	92.4	4.3	25.2	6.3	142.5	17.2	39.1	1202.1
2	8	90.9	3.8	26.0	5.9	142.1	17.3	42.8	1122.4
3	10	96.7	3.3	28.2	6.6	147.2	17.0	41.4	1144.8
4	12	91.1	3.7	26.3	5.5	139.7	17.7	45.6	1009.5
5	14	92.9	4.4	24.5	6.3	144.1	16.4	46.5	1038.7
6	16	86.1	3.2	26.9	5.6	133.3	16.1	58.5	996.2
	LSD 5%	8.9	0.0	3.8	1.1	7.5	1.6	3.5	257.2

P/m=Plants per meter, S/p= seeds per pod, PH=Plant Height, LB=Lateral Branch, P/MB=Pod per Main Branch, T.G.W=Thousand Grain Weight, P/p=Pods per plant.

Table3. Rapeseed yield with different weed control methods

No	Treatment	Yield kg/ha	P/MB	S/P	LB	P/P	PH (cm)
1	A	571.4	23.7	16.0	5.2	54.2	122.2
2	B	1174.6	21.7	15.8	5.6	56.0	117.1
3	C	723.8	24.6	17.6	6.3	50.6	125.0
4	D	761.9	21.6	16.4	6.1	60.6	120.5
5	E	777.8	23.2	14.8	5.7	55.8	115.7
	LSD 5%	147.7	5.4	2.4	1.0	6.7	9.9

A. Check- no weed control, B. Complete weed control by manual labour, C. One rotary hoeing, after weeds are about two weeks old, D. One cultivator hoeing at rosette formation, E. Post-emergence spray of herbicide. S/p= seeds per pod, PH=Plant Height,P/p=Pods per plant, LB=Lateral Branch, P/MB=Pod per Main Branch,T.G.W=Thousand Grain Weight.

References

1. Beg, A 1994. Status and potential of some oilseed crops in WANA region. Special Study Report. ICARDA Allepo, Syria
2. Downey, R.K., Rimmer, S.R., 1993. Agronomic improvement in oilseed Brassicas. Advances in Agronomy 50: 1-50
3. Rashid, A., A. Beg, A.A. Attary, H. Ketata, N. Ali, S.S. Pourdad and K. Alizadeh.2002. Oilseed crops for the highlands of CWANA. Caravan, 16: 27-29. ICARDA Publisher.
4. Sadri. A., and T.Banai. 1996.Chickpea in Iran pp23-33. In adaptation of chickpea in the west asia north africa region. N.P.Saxena, M.C. Saxena, C. Johanson (Eds) ICRISAT and ICARDA Publisher.
5. Talliee, A. and S.S. Pourdad. 2002. Study on pattern and probabilities of precipitation on yield of wheat in rainfed areas of Iran. In proceedings of second international conference on sustainable agriculture for food, energy and industry. Sep 8-13, Beijing, China.
6. Thomas, P. 1984. Agronomic characteristics of *B. napus* and *B. campestris*. In Canola Growers Manual p.206. Canola Council of Canada.