

FIELD SELECTION

Soils

Sunflowers grow best on well drained, high water-holding capacity soils with a nearly neutral pH (pH 6.5-7.5). The optimum soil classifications for sunflowers are loam, silty loam and silty clay loam soils. Sunflower production performance on reduced agricultural capacity soils such as those affected by salinity, drought potential or wetness, is not ideal, but compares with of other commonly grown commercial crops.

Crop rotation

Having a proper crop rotational sequence is important with all crops, including sunflowers. Extended crop rotations help reduce disease inoculum loads in the soil, allow for herbicide rotation, manage overwintering insect populations, weeds, water usage and fertility management.

Growers who do not have adequate crop rotation, will likely be confronted with one or more of the following yield-reducing problems:

- ❶ Disease and disease-infested fields (e.g. increased sclerotinia)
- ❷ Increased insect risk
- ❸ Increased populations of certain weed species
- ❹ Increased populations of volunteer sunflowers
- ❺ Soil moisture depletion
- ❻ Allelopathy or phytotoxicity of the sunflower residue to the sunflower crop

FERTILIZER

General

Germinating sunflower seeds are very sensitive to seed-placed fertilizer. Starter applications should be placed away from the seed. When sunflowers are seeded with row equipment, all phosphate and potassium should be side banded 2" beside and 2" below the seed during planting. Some or all of the nitrogen can also be sidebanded. The total amount of fertilizer material sidebanded should not exceed 300 lb/ac.

Nitrogen applications can be made pre-plant, at seeding, post-seeding, side-dress or a combination of these methods. Application should be timed so nitrogen is available for rapid plant growth and development. Often, it is logistically advantageous to apply nitrogen in the fall. However, the longer the time period between application and plant use, the greater the possibility for N loss. Fall application is not recommended in sandy soils since the opportunity for leaching is much greater. A side-dress application of N when the sunflower plants are about 12 inches high is often preferable.

Phosphate and potash may be fall or spring applied before a tillage operation. These nutrients are not readily lost from the soil since they attach to the soil forming only slightly soluble compounds. Phosphorus can be applied preplant-broadcast, preplant banded, or banded at seeding. Band applied applications are most efficient, especially when only small amounts are applied in fields low in available phosphorus. Potassium deficiencies normally only occur in sandy soils. Potassium that is band placed is about twice as efficient as broadcast applications.

Table 2. Nutrient uptake and removal by sunflower in Manitoba studies.

Nutrient	Uptake	Removal	Uptake	Removal
	lb nutrient for a 2000 lb crop		lb nutrient per cwt	
Nitrogen (N)	74-122	48-66	3.7-6.1	2.4-3.3
Phosphorus (P ₂ O ₅)	24-56	18-26	1.2 – 2.8	0.9 – 1.3
Potassium (K ₂ O)	150-172	18-26	7.5 – 8.6	0.9-1.3
Sulphur (S)	8-12	3-4	0.39 – 0.58	0.17-0.22
Calcium (Ca)	54-94	3-4	2.7-4.7	0.15-0.23
Magnesium (Mg)	37-39	6-7	1.86-1.93	0.30-0.36

Fertilizer applications should be made based on a soil test. Recommendations based on soil testing were developed by Manitoba Agriculture, Food and Rural Initiatives (MAFRI) and are listed in Tables 3 and 4 . Recommendations are based on a 0-24" sample for nitrate-nitrogen and sulphate-sulphur. Phosphorus and potassium are based on a 0-6" sample.

Table 3. Nitrogen recommendations for sunflower (based on spring band application).

		TARGET YIELD (lb)			
Fall Soil NO ₃ -N		1750	2,000	2,250	2,500
lb/ac in 0-24"	Rating	Nitrogen Recommendations (lb/ac)			
20	VL	40	85	125	170
30	L	20	60	105	145
40	M	0	35	80	120
50	M	0	10	55	100
60	H	0	0	30	75
70	H	0	0	5	50
80	VH	0	0	0	25
90	VH	0	0	0	0
100	VH+	0	0	0	0

Table 4. Phosphorus, potassium and sulphur recommendations for sunflower based on soil test levels and placement.

PHOSPHORUS			POTASSIUM						SULPHUR			
Soil Phosphorus (0-6")			Fertilizer Phosphate (P ₂ O ₅) Recommended (lb/ac)	Soil Potassium (0-6")			Fertilizer Potash (K ₂ O) Recommended (lb/ac)			Soil sulphate-Sulphur (0-24")		Fertilizer Sulphur (S) Recommended (lb/ac)
ppm	lb/ac	Rating	Sb ₂	ppm	lb/ac	Rating	Sb ₂	PPI ₃	lb/ac	Rating	N/A ³	
0	0	VL	40	1	0	VL	30	60	0	VL	20	
	5	VL	40	25	50	VL	30	60	5	VL	20	
5	10	L	40	50	100	VL	15	30	10	VL	20	
	15	L	35	75	150	L	15	30	15	L	20	
10	20	M	30	100	200	L	0	0	20	L	20	
	25	M	20	125	250	M	0	0	25	M	20	
15	30	H	15	150	300	M	0	0	30	M	20	
	35	H	10	175	350	H	0	0	35	H	0	
20	40	VH	10	200	400	VH	0	0	40	VH	0	
20+	40+	VH+	10	200+	400+	VH+	0	0	40+	VH+	0	

Sb² = Side Banded

Adapted from the Manitoba Agriculture Food and Rural Initiatives.

PPI³= broadcast and pre-plant incorporated

N/A³= placement does not influence effectiveness of sulphate forms of sulphur fertilizer

Plant Tissue Analysis

Plant tissue analysis is an important tool in assessing nutrient status of the growing crop. Following are plant tissue analysis interpretive criteria used by the former Manitoba Agriculture Provincial Testing laboratory (Table 5). These levels should be used for the top one to three most mature leaves at the bud stage. However, if a deficiency is detected at this stage, yield potential has already been affected. This sampling method is best used as an auditing tool to determine if your fertility program is sufficient for the yield potential. If a nutrient deficiency is observed earlier, sample plants and soil from the affected area and contrast results with plant and soil samples from an adjacent, normal looking area. This is considered diagnostic sampling and could be used to correct some in-season deficiencies. Consult with your soil and plant tissue laboratory for guidelines when sampling at other growth stages.

Table 5. Sunflower tissue analysis interpretation

Nutrient	CONTENT				
	Low	Marginal	Sufficient	High	Excess
Nitrogen % N	1.4	1.5-1.9	2.0-3.4	3.5-3.9	4.0
Phosphorus %P	0.14	0.15-0.24	0.25-0.49	0.5-0.79	0.8
Potassium %K	0.9	1.0-1.4	1.5-2.9	3.0-4.9	5.0
Sulphur %S	0.14	0.15-0.19	0.2-0.39	0.4-0.99	1.0
Calcium %Ca	0.19	0.2-0.29	0.3-1.9	2.0-2.4	2.5
Magnesium %Mg	0.09	0.1-0.19	0.2-1.4	1.5-1.9	2.0
Zinc ppm ZN	11	12-14	15-69	70-149	150
Copper ppm (Cu)	2	3-5	6-24	25-74	75
Iron ppm (FE)	14	15-19	20-249	250-499	500
Manganese ppm (Mn)	9	10-14	15-99	100-249	350
Boron	No provincial guidelines developed. Consult analytical companies				

Special Fertility Considerations

Sunflowers have deep tap roots that can obtain water and nutrients five to six feet (1.5 to 1.8 meters) deep in the soil. These reserves of water and nutrients are unavailable to most other annual crops, making sunflower a good rotational crop. Sunflowers have the ability to scavenge nitrogen that has leached below the rooting depth of other crops.

SEEDING

Planting dates

Sunflower seeding should usually begin anytime after May 1 and ideally be completed by June 1. Seedlings are relatively frost tolerant up to the four-leaf stage. Choose earlier maturing hybrids or oil type hybrids if planting is delayed into the first week of June or for replanting. Oil type hybrids are shorter maturing than confection varieties. Planting date can also affect susceptibility to pests. Consult the following chapters as to when to plant to avoid damage by the most prevalent pest in your area.

Plant Populations and Row Spacing

Seeding rate for sunflowers depends on sunflower type. Oil seed varieties are generally planted at higher populations than confectionary varieties. Oil-type sunflower populations range from 20,000 to 22,000 plants/acre (0.6 plants/ft²).