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Optimum Corn Planting Depth - "Don't Plant Your Corn Too Shallow"

by Gregory Luce

There are a lot of factors that influence corn stand and final yield. Some we cannot control and some we can. One easy way to give your corn crop the best opportunity for consistent stand level, and ultimately yield potential, is to plant at the proper depth.

The old rule of thumb (index finger in this case) is to plant corn seed at a depth equal to the second knuckle on their index finger. Well, not everybody has the same length fingers so a bit more accurate measurement is in order for this important management decision.

University Extension publications across the Midwest typically recommend a corn seeding depth of 1.5 to 2.5 inches. Most agronomists will agree that planting corn too shallow leads to more frequent problems than planting too deep. From my experiences, bad things happen when corn seed is planted shallower than 1.5 inches. Therefore, I recommend targeting 2 inches as an excellent depth for corn planting.

A primary reason to target a 2 inch depth is to achieve good seed-to-soil contact. In order to accomplish this throughout the seedbed, the seed needs to be where the moisture levels are most consistent. Uneven soil moisture throughout the seed zone is the primary cause of uneven emergence, the results of which can easily be yield losses of 8 to 10 percent. http://corn.agronomy.wisc.edu/Pubs/UWEX/NCR344.pdf

Rootless corn can result if planting corn too shallow.

The second reason for the recommended planting depth is to establish a strong nodal root system. The nodal root system not only helps support the corn plant structurally, but is also responsible for uptake of the vast majority of the water and nutrients the plant needs. A good nodal root system is essential in reducing early season root lodging as well as helping the plant perform better under drought stress later in the season. A shallower planting depth, especially less than 1.5 inches, can lead to early-season root lodging due to shallow nodal root development or corn injury from pre-emergence herbicides.

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In This Issue

Fusarium Head Blight or Scab of Wheat (and Other Head Diseases of Winter Wheat)

by Laura Sweets

Fusarium head blight or scab of wheat was unusually widespread and severe in Missouri last year. Although it is difficult to predict what will develop this season, the forecast for continued rainy weather as the wheat crop flowers across much of the state increases the risk for this disease again in 2016.

Now is the time to be considering the use of a fungicide application to manage Fusarium head blight or scab of wheat. Fusarium head blight or scab of wheat develops on plants in the flowering to early grain fill stages of growth. Infection is very dependent on environmental conditions while wheat is in susceptible stages of growth, i.e. flowering. Moderate temperatures in the range of 77-86°F, frequent rain, overcast days, high humidity and prolonged dews favor infection and development of scab. Weather conditions over the next several weeks will determine the extent and severity of scab in this year's wheat crop. Fusarium head blight or scab problems will be more severe if rains coincide with flowering of wheat fields. If the rain continues as the crop moves through the flowering stages, the risk for scab will increase.

The most recent Missouri Agricultural Statistics Reports shows 23% of the wheat crop heading about 6% above the five year average. So much of the wheat crop is in or soon will be in the susceptible stage of growth for scab. The forecast for much of the state is continued scattered rain storms although the actual rainfall has been variable. But conditions for the development of scab do exist in much of the state.

The characteristic symptom of scab on wheat is a premature bleaching of a portion of the head or the entire head as shown in Figure 1. Superficial mold growth, usually pink or orange in color, may be evident at the base of the diseased spikelets as shown in Figure 2. Bleached spikelets are usually sterile or contain shriveled and or discolored seed. The susceptibility or resistance of the variety to Fusarium head blight will have an effect on how much of the head develops symptoms. On susceptible varieties, initial infection may be confined to several spikelets but if weather conditions remain favorable, the entire head may eventually be infected. Varieties with more resistance may only have individual spikelets showing symptoms.

Figure 1: Premature bleaching of a portion of the wheat's head.

Figure 2: Superficial mold growth at the base of diseased spikelets.

Scab is caused by the fungus *Fusarium graminearum*. This fungus overwinters on host residues such as wheat stubble, corn stalks and grass residues. Spores are carried by wind currents from the residues on which they have survived to wheat heads. If environmental conditions are favorable, i.e. warm and moist, the spores germinate and invade flower parts, glumes and other portions of the spike. Scab infection occurs when favorable environmental conditions occur as the wheat crop is in the flowering to early grain fill stages.

Unfortunately, the detrimental effects of scab are not limited to its adverse effects on yield. The fungi which cause scab may also produce mycotoxins. Vomitoxin

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(deoxynivalenol or DON) and zearalenone may occur in wheat grain infected by scab fungi. This is a primary concern where grain is fed to non-ruminant animals. Ruminants are fairly tolerant of these two mycotoxins. Also, the fungi which cause scab may survive on the seed and can cause seedling blight and root rot problems when scabby grain is used for seed.

Crop rotation, variety selection and residue management are preventative measures for managing scab in wheat. At this point in the season the only remaining management option would the application of a fungicide to try to reduce scab levels. Every year, university and extension wheat pathologists meet and develop a fungicide efficacy table for wheat diseases. The name of the committee that meets and develops the table is the North Central Regional Committee on Small Grain Diseases (NCERA 184). The most-recent version of the table can be found by clicking this link. The fungicide table in this issue of the Integrated Pest & Crop Management Newsletter lists the fungicides labeled for the suppression of Fusarium head blight or scab. Caramba and Prosaro have given the best results in multi-state fungicide trials over the last several years. However, there are other products labeled for use against scab. As noted in the accompanying table there are also a number of fungicides which are not labeled for use against scab. It is also important to note growth stage restrictions or pre-harvest intervals for these fungicides.

Growers should be scouting fields to get a feel for incidence and severity of scab in this year's wheat crop. Because of possible mycotoxin concerns and seed quality concerns, grain from fields with scab may require special handling. Wheat planted on corn, sorghum or wheat residue (even wheat double cropped with soybeans) has a greater risk for scab.

Other Head Diseases of Winter Wheat:

From flowering through the early stages of grain fill is also the time to scout for other head diseases of wheat such as loose smut, Septoria and Stagnospora infections on heads, bacterial stripe and black chaff on heads and take-all.

Loose smut is obvious as heads emerge from the boot and for several weeks after that. The kernels on infected heads are replaced with masses of powdery black spores. So the heads have a very distinct black, powdery appearance. These spores are eventually dislodged by wind and rain, so later in the season the smutted stems are less evident and only the bare rachis will be left. Spores produced on smutted heads are wind carried to adjacent plants in the field and infect through the flowers. The fungus that causes loose smut survives within the embryo of wheat seeds. If infected seed is planted, the plants growing from those seeds will be infected and develop smutted heads the next season. If seed from a field that has a "small" amount of smut in one season is used for seed, the field planted with that seed may have a substantially higher level of smut. Loose smut is best controlled by planting either disease-free seed or using a systemic fungicide seed treatment.

Glume blotch: Septoria leaf blotch is present in the lower canopy of many fields this year. It hasn't seemed to move up in the canopy to the flag leaf or head but with increased precipitation and high humidity it could still develop on flag leaves and heads. On the heads dark brown to black blotches may develop. *Stagnospora nodorum* may also cause leaf lesions but is usually more common on heads- again causing dark blotches on glumes of part or all of the head.

Bacterial stripe or black chaff is a bacterial disease that produces symptoms on both leaves and heads. Water-soaked lesions may develop on young leaves. These expand into reddish-brown to brownish-black streaks on the leaves. Glumes and awns show brown-black blotches or streaks. Fungicides are not effective against bacterial stripe or black chaff so the use of resistant or tolerant varieties and crop rotation are the main management options.

Weed of the Month: Field Pennycress

by Blake Anderson, Mandy Bish, Kevin Bradley and Oscar Perez-Hernandez

Field pennycress (*Thlaspi arvense*), also known as stinkweed, fanweed, frenchweed, or mithridate mustard, is a summer or winter annual plant native to Eurasia. A member of the mustard family (Brassicaceae), field pennycress could have been introduced into the United States as early as the 1700s1 and now it is found in almost every state, from Florida and Texas to as far north as Alaska. Infestations of field pennycress occur in disturbed nonagricultural areas and agricultural lands (pastures and croplands) over a wide range of soil types and environmental conditions (Figures 1 and 2).

Field pennycress is a broadleaf, herbaceous plant that has a high degree of genetic variation[1]. Seedlings develop into compact, basal rosettes (Figure 3) that possess slender taproot systems. Stems originating from the basal rosette are hairless and usually simple but can be freely branched, especially towards the top. When growing in unfavorable conditions, the stem remains unbranched and may reach only a few inches in height, but in fertile soils and with little competition, the main stem may grow vertically up to 32 inches and many lateral branches can arise from the basal nodes[2] (Figure 4).

The leaves of the basal rosettes are simple, alternate, hairless, and have wavy margins (Figure 5). However the leaves along the flowering stem are much different. They attach directly to the stem, without petioles, have toothed margins with pointed lobes that clasp the stem (Figure 6). Basal leaves senesce and fall off at maturity. During the summer, late-flowering field pennycress plants can be distinguished from early-flowering plants by differences in leaf shape. Leaves of the late-flowering plants have longer petioles and deeper serrations than those of the early-flowering cohorts[3].

Figure 1: Field Pennycress can invade nonagricultural areas, such as this gravel road.

Figure 2: Field Pennycress can also invade agricultural lands, such as this plant growing in a harvested soybean field.

Figure 3: Initially Field Pennycress grows as a basal rosette. The plant can overwinter at the rosette stage.

Figure 4: In fertile soils and with little competition, Field Pennycress will grow with 1 main stem and many lateral branches arising from near the base of the plant.

Figure 5: The leaves of the basal rosette of Field Pennycress, and have wavy margins. iguennycress flowers are white and produced in clusters at the top of the stem. Each flower is attached on a short stalk or peduncle. The stem leaves have toothed margins with pointed lobes, lack petioles, and clasp the stem.

Figure 6: Field pennycress flowers are white and produced in clusters at the top of the stem. Each flower is attached on a short stalk or peduncle. The stem leaves have toothed margins with pointed lobes, lack petioles, and clasp the stem.

Field pennycress flowers are produced in clusters at the top of the stems (Figure 6). Individual flowers are about 1/8 inch wide, have four green sepals and four white petals, and are attached to slender, 1-inch long, pedicels or short stalks (Figure 6). Each flower produces a single seedpod called a silicle or seed capsule, which is bright green, about ½ inch long and ½ inch wide, and nearly circular. The seedpods have two cells, each containing seeds surrounded by a wide membranous wing (Figure 7). They are round and flat, about 0.4 inches in diameter, broadly winged and with a notch at the tip. Each plant can produce as many as 20,000 seeds, which can remain viable in the soil for as long as 20 years[4] and are easily dispersed by wind and water. It is suggested that seeds produced by winter annual populations are initially non-dormant in autumn, but become dormant in winter while those produced by summer annual populations are dormant in autumn and become non-dormant during winter[1].

Figure 7: The seedpods of Field Pennycress have 2 cells that contain seeds and are surrounded by a wide, membranous wing.

Figure 8: Heavy infestation of Field Pennycress taking over a pasture area.

Field pennycress overwinters as seeds or vegetative rosettes4. In Missouri, field pennycress seedlings can emerge in late February and adult plants start blooming by middle March, depending on the accumulated temperatures towards the end of winter; first mature seed are produced by end of April or middle May.

Infestations of field pennycress occur in small or large patches, either as individual or clusters of plants and in mix with other weeds. Systematic observations in Missouri indicate that in heavy infestations, up to 100 plants/square foot can occur (Figure 8). In soybean, heavy infestations of field pennycress are problematic because pennycress is reported as a suitable host of the soybean cyst nematode[5].

Field pennycress plants may be confused with those of pepper grass (*Lepidium densiflorum*), but the leaves of pepper grass do not clasp the stem and the flower petals are shorter than the sepals. In field pennycress, this arrangement of the petals and sepals is the opposite. In addition, the leaves of field pennycress, when crushed, have a rank, garlic-like odor, hence the alternate name "Stinkweed."

Field pennycress can be easily controlled mechanically with tillage or with herbicides. Herbicide treatments will provide best control when plants are in the early stages of development, preferably in the rosette stage when growth is active and before plants start shedding seed. Standard burndown herbicide combinations containing glyphosate or paraquat plus 2,4-D, dicamba, or Sharpen will provide excellent control of field pennycress.

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[1]*Holm L, Doll J, Holm E, Pancho J, and Herberger J. 1997. World weeds: Natural histories and distribution. John Wiley & Sons, Inc. New York, NY.*

[2]*Weed Science Society of America. http://wssa.net/wssa/weed/intriguing-world-of-weeds/#x (then select Pennycress, Field from list). Retrieved on March 15,2016.*

[3]*Best KF and McIntyre GI. 1975. The biology of Canadian weeds. 9. Thlaspi arvense L. Can. J. Plant Sci. 55:279-292.*

[4]*Chepil WS. 1946. Germination of weed seeds. 1. Longevity, periodicity of germination and vitality of seeds in cultivated soil. Sci. Agri. 26:307-346.*

[5]*Venkatesh S, Harrison K, and Riedel RM. 2000. Weed hosts of soybean cyst nematode (Heterodera glycines) in Ohio. Weed technology 14:156-160.*

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Heavy texture soils may require careful planting depth adjustment but it is still important too not plant too shallow.

There are always exceptions to the rules that can rely on some fine tuning. For instance, if soil conditions are dry at planting time, planting to moisture is often practiced to help uniformity of emergence. Soil texture is another factor to consider. In very heavy textured, high clay content soils, corn seeds should not be planted deeper than 2.5 inches. However, in lighter sandy soils planting 3.0 inches deep may be necessary. In fact, planting 2.5 to 3.0 inches is recommended in states to the west of Missouri.

The conditions of every one of your fields may vary dramatically enough to warrant a slightly different seeding depth for each one. Growers should check corn seeding depths when they enter fields with different soil types or tillage practices. It is a recommended practice to spend some time evaluating each field at the time of planting.

Check planting depth when starting each field.

In summary, corn should never be planted less than 1.5 inches deep, 1.75 to 2.25 inches is an ideal target, but depending on soil type and conditions, may be planted up to 3 inches deep without any effect on stand establishment.

Have a safe and successful planting season.

Weather Data for the Week Ending April 28, 2016

Station	County	Weekly Temperature (oF)						Monthly Precipitation (in.)		Growing Degree Days‡	
		Avg. Max.	Avg. Min.	Extreme High	Extreme Low	Mean	Departure from long term avg.	April 1-28	Departure from long term avg.	Accumulated Since Apr 1	Departure from long term avg.
Corning	Atchison	73	52	83	45	62	6	4.71	1.81	226	146
St. Joseph	Buchanan	71	52	78	45	61	5	5.01	1.67	207	115
Brunswick	Carroll	73	53	82	41	63	6	3.16	-0.01	236	131
Albany	Gentry	70	50	79	44	60	4	4.89	1.38	173	99
Auxvasse	Audrain	74	53	81	48	63	5	1.97	-1.52	218	107
Vandalia	Audrain	73	52	81	46	63	6	2.22	-1.31	209	121
Columbia-Bradford Research and Extension Center	Boone	73	53	80	46	63	5	1.75	-2.19	209	78
Columbia-Capen Park	Boone	78	51	84	43	63	4	1.56	-2.45	216	72
Columbia-Jefferson Farm and Gardens	Boone	74	54	80	48	64	6	1.48	-2.42	227	95
Columbia-Sanborn Field	Boone	75	56	82	50	65	6	1.52	-2.41	256	111
Columbia-South Farms	Boone	74	54	80	48	63	5	1.56	-2.4	224	93
Williamsburg	Callaway	75	53	82	46	64	7	2.05	-1.65	214	106
Novelty	Knox	70	51	79	42	60	3	2.31	-1.02	175	84
Mosow Mills	Lincoln	77	53	84	47	64	6	3.58	0.22	223	81
Linneus	Linn	70	51	80	43	61	4	2.14	-1	190	101
Monroe City	Monroe	72	51	82	42	62	5	1.36	-1.93	197	87
Versailles	Morgan	75	54	80	48	64	5	3.13	-0.9	248	85
Green Ridge	Pettis	73	52	79	42	62	5	1.84	-1.94	225	114
Unionville	Putnam	68	50	78	45	59	4	2.13	-1.77	161	103
Lamar	Barton	75	52	78	45	64	5	2.98	-1.25	254	90
Butler	Bates	73	53	78	45	64	5	2.86	-1.22	251	83
Cook Station	Crawford	79	52	82	43	65	6	2.22	-1.79	231	65
Round Spring	Shannon	81	49	85	44	64	5	1.91	-2.21	220	70
Mountain Grove	Wright	76	52	80	46	64	6	2.38	-1.89	210	85
Delta	Cape Girardeau	77	56	81	52	66	5	3.71	-0.53	255	45
Cardwell	Dunklin	81	58	84	52	69	6	0.73	-3.68	328	61
Clarkton	Dunklin	80	56	84	50	68	5	0.95	-3.26	302	47
Glennonville	Dunklin	79	58	82	52	68	5	1.32	-2.78	309	50
Charleston	Mississippi	78	57	84	50	68	7	1.25	-3.03	301	90
Hayward	Pemiscot	78	58	82	52	68	5	1.01	-3.22	299	40
Portageville	Pemiscot	80	59	84	54	69	6	1.37	-2.85	326	62
Steele	Pemiscot	82	58	85	53	69	6	0.77	-3.55	326	64

‡Growing degree days are calculated by subtracting a 50 degree (Fahrenheit) base temperature from the average daily temperature. Thus, if the average temperature for the day is 75 degrees, then 25 growing degree days will have been accumulated.

Weather Data provided by Pat Guinan |GuinanP@missouri.edu | (573) 882-5908

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