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Winter Rations for Brood Sows

Summary of 1917-18 Experiments on the Feeding and
 Management of Pregnant Sows

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Leading swine authorities have estimated that 40 out of every 100 pigs farrowed in Western Canada are either still-born or die shortly after birth. Many of these pigs appear to be perfectly normal but lack sufficient vitality to withstand the difficulties of young pignood. By far the greatest mortality, however, is due to the appearance of the dreaded hairless pig. One man came to this office last spring with a statement something like this: "I bred 100 gilts last fall with the idea of raising my feeder pigs this year instead of buying them at the stock yards. The first 18 gilts have already farrowed and practically every litter has been hairless. What can I do to save the other 82 litters?" He had been feeding a ration consisting largely of shorts, and the gilts were over fat. Was the difficulty due to the feed, to the gilts being too fat, or both? Another breeder states: "I am going out of the hog business this fall for the simple reason that pig losses at time of farrowing have ruined my profits for the last three years." A 40 per cent. loss is certainly a handicap in the production of any class of live stock at any time, but more particularly just now under existing feed and labor costs.

Experienced breeders agree that heavy losses follow years of early frosts where large quantities of frozen grain are fed to the pregnant sows. For this reason many have been firm in the belief that frozen wheat contains certain poisonous properties that make it unsuited to the brood sow ration. Others contend that the greatest difficulties follow long, severe winters where sows have a tendency to remain in their sleeping quarters rather than rustle for a living. This has led them to the conclusion that lack of exercise, insufficient

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water, too little fresh air and lack of sunlight are all important factors. Still others lay the blame to too heavy feeding of barley, lack of protein, a scanty supply of mineral matter, sows becoming too fat, and numerous other causes. Practically every hog raiser has had his own theory as to the actual causes of the losses, but when the ideas of these different men were brought together in an attempt to make their results of service to the beginner, it soon became evident that they differed so widely in their conclusions that the only safe method of procedure was elimination through careful experimentation. The Animal Husbandry Department of this institution, believing that the question had a direct bearing on the campaign for greater pork production, has been devoting considerable time and experimental space to this work.

Many experiments require years of careful repetition before results are of any considerable value. Certain phases of this work are far from settled at this time, but it is felt that many of the results are definite and can be put to immediate use by the practical breeder. We are prepared to go on record as to the suitability of frozen wheat in a ration for pregnant sows; the effects of excessive barley feeding; and as to whether lack of exercise, too little fresh air, and a total absence of sunlight will or will not result in hairless pigs. In outlining this experiment no attempt was made to select feeds that would make the most economical rations under existing conditions. It was deemed more important to begin at the bottom and determine whether feeds that are available on most prairie farms could be fed with safety to pregnant brood sows. Economical rations can be dealt with after the suitability of the different feeds is determined. However, all feed, both morning and evening, was carefully weighed so that we have definite figures as to the cost of the different rations.

Objects of the Experiment.

1. To determine the suitability of frozen wheat as a feed for pregnant sows.
2. Same for a ration consisting entirely of whole oats.
3. Same for a ration of straight barley, and barley supplemented with a protein rich feed.
4. Importance of sunlight, fresh air, and exercise.
5. Value of mineral matter in the ration.
6. Should brood sows be given constant access to water, or will good results follow eating snow.

Breeds Used

5 Berkshires—2 two-year-old sows and 3 gilts.

19 Duroc Jerseys—4 two-year-old sows and 15 gilts.

12 Tamworths—2 two-year-old sows and 10 gilts.

All 36 sows were pure bred—the aged sows having been purchased from leading Alberta breeders while the gilts were raised on the University farm. In each case the aged sows were half sisters and as they were the dams of the gilts in question, all pigs of the same breed farrowed during this experiment carried similar blood lines.

Disposition of the Sows

Table 1 shows the disposition of the sows and gilts in the various lots. In this discussion all the females will be referred to simply as sows—ages can be obtained from the table. The 36 sows were divided into 12 lots of 3 each, with one bacon sow and one of the lard type in each lot. In the 5 lots containing Berkshires the bacon, medium thick and lard types were represented. This division was made so that results would be applicable to all breeds and types of swine.

Another point given consideration was whether early or late farrowing had anything to do with weak or hairless pigs. One sow in each lot was bred to farrow late in March or early April, another to farrow late in April or early May, and the last one to come in the latter part of May or early June.

To secure accurate data on the effect of the different feeds on the sows themselves—each sow was weighed on the date of service and re-weighed in 111 days or the day before she was expected to farrow. All gains in weights will refer to the gain made during this period of pregnancy.

Feeds

Frozen wheat—All frozen wheat used in this experiment was secured from a grain dealer at Rocky Mountain House, Alberta—a district where hairless pigs have long been the bane of the swine breeder.

Oats and Barley—Grown on the University Farm and of good quality.

Wheat bran—Ordinary wheat bran secured through local grain dealers.

Tankage—Meat meal tankage, commonly called tankage, a by-product of the packing plants, and containing 60 per cent. protein.

Garbage—Collected from the University dining hall—thoroughly cooked from 4 to 6 hours before feeding—weights taken in the wet, sloppy condition as fed.

Coal—In all lots except 5 and 6 fine coal was available at all times.

Water—Provided each group except sows in Lot 8.

Salt—Free access to common stock salt.

Sows in Lot 1 were fed and handled under what was considered ideal conditions and served as a check on the limited-exercise Lot 7, the snow-fed Lot 8 and the no-sunlight Lot 12. The morning meal, fed at 8 a.m., consisted of a mixture of equal parts crushed oats, crushed barley and bran with 6 per cent. meat meal tankage fed at the rate of 1 lb. per sow. Boiling water was poured over this mixture before being placed before the sows. At noon they were fed 7 pounds per head of thoroughly cooked garbage; at 3.30, 1 1-3 pounds per head of whole oats were scattered on the ground to force exercise, and water, fine coal and salt were available at all times. Sleeping quarters were kept clean and comfortable and placed a considerable distance from the feed trough to insure added exercise. These sows made an average gain of 87 pounds during pregnancy, were vigorous and thrifty and relished their feed at all times. They farrowed 22 strong pigs, weighing an average of 2.579 pounds at birth, and raised 19 or 86.36 per cent. During the entire pregnancy period these sows consumed an average of .971 pounds grain and 2.63 pounds garbage per cwt. per day. This system of feed and management insured good results.

In Lot 2 the object was to utilize such feeds as are commonly available on most farms—hence the meat meal tankage and garbage were omitted. The morning feed consisted of slightly over 2 pounds per head of a mixture of crushed oats 5 parts, crushed barley 2 parts and wheat bran 3 parts—scalded and fed in the form of slop. At 3.30 p.m. whole oats at the rate of 1 2-3 pounds per head per day were scattered on the ground to give ample exercise—water, coal and salt being available at all times. One sow in this lot proved to be not in pig—but the two remaining farrowed 12 and 14 pigs respectively. They made an average gain of 66 pounds and came through in good condition with the pigs weighing at birth an average of 2.288 pounds. Though the percentage of pigs raised fell to 76.92 per cent., it would be considered one of the most successful lots in the experiment when the number farrowed is considered—the two sows raising 10 pigs each. The grain requirement of 1.068 pounds per cwt.

per day shows that old sows require less feed in proportion to weight than gilts, though the average gain per sow was less. This ration proved quite economical and insures excellent results.

Results with Barley

That barley should be properly supplemented by a protein rich feed was clearly shown by results obtained from Lots 3, 5 and 11. In the former two lots a ration of straight barley was fed while in the latter the barley was supplemented by 10 per cent. meat meal tankage. In Lot 3 the barley was fed under the very best conditions possible—it was crushed and scalded for the morning feed, scattered on the ground whole in the afternoon to insure exercise, and the amount limited so that the sows were always kept a trifle hungry. They were given constant access to water, coal and salt. Lot 5 was allowed just about what they would clean up of straight whole barley without preparation. Furthermore, coal was withheld from this group of sows. Lot 11 was fed under exactly the same conditions as Lot 3 with the exception that 10 per cent. meat meal tankage was added. This tankage was fed with the barley slop in the morning and in the afternoon fed separately in a little warm water. Results are striking. Sows in Lot 3 made an average gain in 111 days of 82.83 pounds, in Lot 5, 70.33 pounds and in Lot 11 the remarkably high gain of 105.66 pounds. A point worthy of note in this connection is that the gain in weight in Lot 3 was to a large extent due to fat rather than body growth, while the sows in the latter lot developed strong, rugged frames along with reasonable condition. These gains were made on an average daily grain consumption per 100 lbs. live weight of 1.461 pounds in Lot 3, 1.788 pounds in Lot 5, and 1.723 pounds in Lot 11. Lots 3 farrowed 27 pigs, weighing at birth an average of 2.37 pounds and raised 23 or 85.18 per cent. These litters were uneven and a trifle undersized showing that sufficient protein was lacking to properly develop strong vigorous pigs. Lot 5 farrowed 28 pigs and raised but 16 or 57.14 per cent—average birth weight being 1.723 pounds. In this lot 2 pigs were born totally hairless, 5 with scanty covering, while others were decidedly lacking in vitality. The hairless condition of these pigs, low average birth weight, and unthrifty condition of the sows gives every evidence that whole barley is unsuited to the proper nourishment of either the young growing sow or her unborn litter. The barley tankage Lot 11 farrowed 23 strong vigorous pigs, weighing the high average of 2.587 pounds, and raised the en-

ture number of 100 per cent. This proved to be the highest percentage of pigs raised of any lot in the experiment. These figures are well worth a little consideration. Whether the advantage of Lot 3 over Lot 5 was due entirely to a lighter feeding of barley or to the mineral matter provided in the form of coal, or to both, we cannot definitely state. Results obtained in lots fed frozen wheat, under identical conditions, seem to indicate that the heavy feeding is especially dangerous. It is evident that barley alone, even when fed under the very best of conditions, should be avoided as a ration for pregnant sows, but if properly supplemented with a protein rich feed, such as meat meal tankage, it can be fed not only safely but successfully.

Effect of Frozen Wheat

To answer definitely the question as to whether frozen wheat contained certain poisonous properties which made it responsible for the large number of hairless pigs following seasons of early frosts, three lots were devoted to this part of the work. Lot 4 was fed straight frozen wheat under the very best of conditions—crushed and fed as a warm slop in the morning, scattered whole on the ground for the evening meal and in addition salt, coal and water were available at all times. The three sows in this lot made an average gain of 81.66 pounds, but their coat was harsh and wirey, showing that the feed was lacking in certain constituents for proper nourishment. Of the 29 pigs farrowed but 14 were raised, or 48.27 per cent. Their average birth weight was 2.086 pounds. These pigs lacked vitality—one was practically hairless and several others were scantily clothed.

Lot 6 was fed whole frozen wheat without preparation, and without the addition of mineral matter in the form of coal. The amount fed was regulated entirely by the appetite of the sows—they were allowed just what they could clean up handily. These gilts made the lowest average gain of any in the experiment with but 58.66 pounds to their credit. They lacked thrift throughout pregnancy and farrowed a large number of hairless pigs—one litter being entirely hairless. Of the 30 pigs farrowed, with the low average birth weight of 1.792 pounds, but 15 were raised or 50 per cent.

Lot 10 was fed frozen wheat under the same conditions as Lot 4, with the addition of 10 per cent. meat meal tankage. These gilts made an average gain of 87.33 pounds and were sleek and thrifty at all times. Twenty-two pigs were far-

rowed, averaging 2.5 pounds at birth, and 21 or 95.45 per cent. were raised. All pigs were strong and active and gave every evidence of sufficient pre-natal nourishment.

The grain requirement per 100 pounds live weight throughout the experiment was 1.508 pounds for Lot 4, 1.880 pounds for Lot 6, and 1.866 pounds for Lot 10. With weak hairless pigs in both Lots 4 and 6, it seems that the difficulty is due more to a lack of proper constituents in the frozen wheat itself, than to the lack of added mineral matter in the form of coal. At any rate, hairless pigs appeared in Lot 4 where the frozen wheat was fed under the best of conditions, the amount limited, and the sows given free access to coal. Results proved conclusively that frozen wheat does not contain poisonous properties resulting in hairless pigs, but if fed as a single feed, hairless pigs are to be expected as a result of the deficiency in protein. With the addition of a proper protein supplement, as meat meal tankage, frozen wheat can be fed with every assurance of excellent results.

Value of Oats

Lot 9 was fed whole oats scattered on the ground for both morning and evening feeds and allowed free access to coal, salt and water. These gilts made a rather low average gain of 59.66 pounds and lacked somewhat the thrifty appearance of the frozen-wheat-tankage and barley-tankage lots, but the gain in weight was due to body growth rather than fat. The pigs came large and strong, weighing an average of 2.56 pounds at birth. Of the 25 farrowed, 21 were raised or 84 per cent. In this case, the grain consumed per hundred pounds live weight throughout the period was 1.559 pounds. No doubt more feed would have been consumed and larger gains made if the morning feed had been crushed, scalded and fed in a warm slop, for, as with all classes of animals, brood sows like variety. Oats proved to be a well-balanced feed for pregnant sows and should make up a large part of the ration in a country so well adapted to oat production.

The Effect of Exercise

Many swine producers have attributed hairlessness in young pigs to insufficient exercise during pregnancy. It is common belief that the greatest losses follow long severe winters, when the sows spend the greater part of their time

in the straw pile, or under other protection. To secure data on this point, three gilts were placed in a 6' by 7' frame house with the addition of a 4' by 14' runway. These sows were fed the same kind and practically the same amount of feed as check Lot 1, with the exception that the evening feed of oats was crushed and fed in the form of slop to prevent exercise. Several hog men visited the farm during the experiment and all predicted poor results from this lot, for the gilts took very little exercise and hence became excessively fat, leading all lots in average gains for the period with 120 pounds per head to their credit. In all, 26 pigs with an average birth weight of 2.43 pounds were farrowed in this lot, and 20 or 76.92 per cent were raised. All pigs came strong and were normal in every respect. It should be born in mind that old sows that become excessively fat are sluggish and tend to crush a large number of their young, while gilts were used in this test and hence there were no losses from this source. Furthermore, sows confined in cramped quarters are often subject to unsanitary conditions. The importance of an abundance of exercise for young pigs in preventing thumps and the like is well known to all. It should be understood that this Department does not recommend limited exercise for pregnant sows—far from it, we insist on plenty of out-door work for all breeding stock. This experiment, however, leads us to the conclusion that lack of exercise is not the cause of hairlessness in new born pigs.

Forcing Sows to Eat Snow

Quite a number of farmers have followed the practice of forcing sows to eat snow in place of providing water during the winter months. Often times these men suffer heavy losses from hairless or weak pigs and naturally credited their pig troubles to this method of watering. To secure information on this point, three sows were placed in Lot 8 and fed the same ration as Lot 1, with the exception of the garbage, which had to be eliminated on account of the moisture content. All grains were fed dry. The last snow or any consequence disappeared on March 27th, so that but one gilt farrowed under these conditions—her litter of 8 pigs weighing but 12 pounds or an average of 1.5 pounds each. One pig came dead, another died in a few hours and two others within the next two weeks, so that she raised but 4. These sows made low gains during the winter months, lacked thrift and were badly tucked up in the middle. The other two sows made fair gains during the balance of the spring, so that the

average gain for the period was 76.33 pounds, and the average birth weight of pigs for the lot 2.155 pounds. Of the 29 pigs farrowed 19 were raised or 65.51 per cent. Due to the fact that two of these sows farrowed some time after the last snow disappeared and water was provided, this part of the experiment will be given further attention during the coming winter. Such results as were obtained would indicate that hairlessness cannot be attributed to this practice but that far better results would follow free access to water.

Importance of Sunlight

To determine the influence of sunlight on the unborn litter, three sows were wintered in a 30' by 40' shed with 7' walls. This shed was constructed with poplar poles and straw—the walls being two feet thick, tightly packed with straw, and the roof covered with the same material to a depth of 18 inches. The two doors, facing the south, were then made light proof so that it was impossible to discern a single object inside the building. All sows were placed in the shed on December 17th, 1917. The first farrowed March 21st, the second April 23rd, and the last one May 20th, 1918, so that the latter was kept under these conditions for a little over five months. With the exception of time of feeding, they were fed just as in Lot 1. To insure sufficient exercise, the morning feed was given at 8 a.m., then garbage at 11 a.m., water again at 1 p.m., and whole oats scattered in the bedding at 3.30 p.m. By this means the sows were on their feet a good share of the day so that the only difference from conditions as found in Lot 1 were the lack of sunlight and less fresh air due to the complete closing in of all walls. The only ventilation possible was through the straw covering over the roof. These sows made an average gain of 96.33 pounds during pregnancy, farrowed 29 pigs weighing an average of 2.62 pounds, and raised 25 or 86.20 per cent. All pigs came strong and gave no evidence of the peculiar method of housing. It is again wished that swine breeders place the proper interpretation on this part of the experiment. A continued practice of this sort would soon lead to an outbreak of disease for such quarters soon become unsanitary. Furthermore, every effort should be put forth to make every possible use of nature's greatest purifier—sunlight. These results show that weakness or hairlessness in pigs cannot be rightly attributed to lack of sunlight during the period of pregnancy.

Successful Rations for Pregnant Sows

During this experiment the following rations proved successful. Weights of sows and daily rations here shown were the average for the three sows in each lot during the entire pregnancy period.

I.—Gilts Weighing 265 Pounds

When fed	Mixture	Amt.fed pr. sow pr. day
A.M.	Crushed oats—3 parts " barley—3 parts Bran —3 parts 6 per cent. tankage	1 lb. in form of slop.
Noon	Garbage or kitchen refuse	7 lbs. thoroughly cooked.
P.M.	Whole oats	1 1-3 lbs. scattered on ground.

Water, salt and coal at will.

II.—Gilts Weighing 225 Pounds

When fed	Mixture	Amt.fed pr. sow pr. day
A.M.	Whole oats.	1 2-3 lbs. scattered on ground.
P.M.	Whole oats.	1 2-3 lbs. scattered on ground.

Water, salt and coal at will.

Variety would be added to this ration by crushing the morning feed of oats and feeding in the form of slop.

III.—Gilts Weighing 215 Pounds

When fed	Mixture	Amt.fed pr. sow pr. day
A.M.	Ground frozen wheat 10 per cent. tankage	1.8 lbs. fed as slop.
P.M.	Tankage Frozen wheat whole	.17 lbs. fed in warm water. 1.66 lbs. scattered on ground.

Water, salt and coal at will.

IV.—Gilts Weighing 220 Pounds

When fed	Mixture	Amt.fed pr. sow pr. day
A.M.	Ground barley 10 per cent. tankage	1.8 lbs. fed as a slop
P.M.	Tankage	.17 lbs. fed in warm water.
	Whole barley	1.66 lbs. fed whole on ground
Water, salt and coal at will.		

V.—Sows Weighing 370 Pounds

When fed	Mixture	Amt.fed pr. sow pr. day
A.M.	Crushed oats 5 Crushed barley 2 Wheat bran 3	2 lbs. fed in slop form.
P.M.	Whole oats.	1 2-3 lbs. scattered on ground.
Water, salt and coal at will.		

CONCLUSIONS

1. Frozen wheat as a single feed, even though fed under the best of conditions, resulted in weak hairless pigs.
2. With 10 per cent. meat meal tankage added to a straight frozen wheat ration, sows wintered in excellent condition and produced strong, vigorous litters.
3. Farrowing troubles have not been due to certain poisonous properties in frozen wheat, but to a deficiency of necessary food compounds.
4. Barley alone should not be fed to pregnant sows. When fed under the very best of conditions sows had a tendency to lay on fat rather than body growth and their pigs were somewhat small and lacking in uniformity. Sows fed a heavy barley ration without additional mineral matter, farrowed small weak litters with some pigs totally hairless and others scantily clothed.
5. Barley, plus 10 per cent. meat meal tankage, resulted in sows making excellent gains, farrowing strong, vigorous

- pigs, and in this instance raising every pig farrowed.
6. Sows wintered on whole oats made rather low gains, but these gains took the form of growth rather than body fat. The litters came strong and uniform.
 7. Lack of sunlight and limited exercise do not cause hairless pigs. Such conditions are undesirable for other reasons.
 8. Results obtained in this experiment on the question of forcing sows to eat snow are not complete, but point to the fact that better results would follow liberal watering. Water with the chill removed is to be preferred.
 9. If additional mineral matter is needed, it can be provided easily and cheaply by giving the sows access to fine coal. At any rate, sows relish this addition to their regular grain ration.
 10. Pigs appreciate variety as well as people, so make use of the kitchen refuse or garbage. If thoroughly cooked, it can be fed safely to pregnant sows.
 11. A greater number of weak or hairless pigs were farrowed in early, than in later litters. All pasturage was withheld from late farrowing sows so that feed conditions were identical to the other sows in the lot. The cause of this difference was not determined.
 12. In this experiment, protein was added to carbohydrate-rich rations by the use of 60 per cent. meat meal tankage. Where this feed is not available the necessary protein can be supplied by utilizing skim milk, buttermilk or flax seed oil meal—all high in this important body requirement.

Pregnant sows must be well fed. In this experiment every sow that was properly fed farrowed a good average litter, regardless of other conditions. For continued success in avoiding outbreaks of disease, however, the breeder must use as much intelligence in the care and management of the bred sows as in the selection of the ration.

	Oats 3; Barley 3 a.m. Bran 3; Tankage 6% Garbage - Noon Oats whole - p.m.	Oats 5 - a.m. Barley 2 - " Bran 3 - " Oats whole - p.m.	Barley prepared	Frozen Wheat prepared	Barley whole	Frozen wheat whole
<i>Lot Number</i>	1	2	3	4	5	6
<i>Breed and Age</i> G—Gilt S—Sow 2 years	Duroc G. Berk. G. Tam. G.	Duroc S. Berk. S. Tam. S.	Duroc S. Duroc G. Tam. G.	Duroc S. Duroc G. Tam. G.	Duroc G. Duroc G. Tam. G.	Duroc G. Duroc G. Tam. G.
<i>Size of Litter</i>	8 8 6	14 12 0	11 7 9	11 10 8	9 10 9	12 12 6
<i>Total pigs at birth</i>	22	26	27	29	28	30
<i>Number Died</i>	3	6	4	15	12	15
<i>Total pigs raised</i>	19	20	23	14	16	15
<i>Per centage raised</i>	86.36	76.92	85.18	48.27	57.14	50.00
<i>Av. birth wgt. of pigs</i>	2.579	2.288	2.370	2.086	1.723	1.792
<i>Condition of pigs</i>	Ex.	V.G.	Fair	Poor	Poor	Poor
<i>Condition of Sows</i>	Ex.	V.G.	Fair	Poor	Poor	Poor
<i>Ave. gain per sow 111 days - in lbs.</i>	77.00	66.00	82.83	81.66	70.33	58.66
<i>Feed consumed (grain per 100 lbs. live weight)</i>	971 2.63	1.068	1.461	1.508	1.788	1.880

Ex.—Excellent.

V. G.—Very Good.

	Exercise limited Feed same as Lot I.	Snow — to March 27 Feed— same as Lot I. except fed dry No garbage	Whole Oats only	Frozen Wheat plus 10 per cent Tankg.	Barley plus 10 per cent Tankg.	No Sunlight Feed same as Lot I.
<i>Lot Number</i>	7	8	9	10	11	12
<i>Breed and Age</i> G—Gilt S—Sow 2 years	Duroc G. Berk. G. Tam. G.	Duroc G. Berk. S. Tam. G.	Duroc G. Duroc G. Tam. G.	Duroc G. Duroc G. Tam. G.	Duroc G. Duroc G. Tam. G.	Duroc S. Berk. G. Tam. S.
<i>Size of Litter</i>	6 11 9	8 13 8	7 9 9	7 9 6	6 9 8	8 11 10
<i>Total pigs at birth</i>	26	29	25	22	23	29
<i>Number died</i>	6	10	4	1	0	4
<i>Total pigs raised</i>	20	19	21	21	23	25
<i>Percentage raised</i>	76.92	65.51	84.0	95.45	100.0	86.20
<i>Avg. birth wt. of pigs</i>	2.43	2.15	2.56	2.50	2.587	2.62
<i>Condition of pigs</i>	Good	Fair	V. G.	Ex.	Ex.	V. G.
<i>Condition of sows</i>	Too fat	Fair	Good	Ex.	Ex.	Good
<i>Av. gain per sow 111 days - in lbs.</i>	120.0	76.33	59.66	87.33	105.66	96.33
<i>Feed consumed (grain Per 100 lbs. (grbge. Live weight.</i>	1.097 2.65	1.468	1.559	1.866	1.724	.775 2.181

Ex.—Excellent.
V. G.—Very Good.