distillation of the pyrolysates. Young's 8-pear pyrex column is used in all cases.

TABLE I
Analysis of the fraction boiling 173-78° C./745 mm.

	Temperature of pyrolysis ±15° C.	% Yield on the wt. of carene fed	Iodine value (Wijis method)	d_{15}^{15}	n_D^{20}
1	300° C.	28·0	84·0	0·8572	1·4820
2	350° C.	23·6	77·0	0·8627	1·4875
3	400° C.	20·5	79·7	0·8631	1·4860
4	500° C.	14·9	71·3	0·8805	1·5013

TABLE II
Analysis of the pyrolysates.

	B.P. C. 745 mm.	% yield on the wt. of carene			
		Pyrolysis temperature ±15° C.			
		300° C.	350° C.	400° C.	500° C.
1	Gases	15·0	11·8	8·9	33·0
2	-75°	0·5	0·9	2·2	4·1
3	75–100°	2·0	0·9	1·3	2·0
4	100–120°	1·0	0·9	0·4	3·7
5	120–143°	1·5	1·8	4·0	7·5
6	143–163°	9·0	8·1	8·4	9·1
7	163–173°	30·0	38·1	37·5	11·5
8	173–178°	28·0	23·6	20·5	14·9
9	Above 178°	12·0	10·9	10·3	12·4
10	Losses, etc.	1·0	3·0	6·5	1·8

At 400° C. and 500° C. Fe_2O_3-gypsum is a more efficient catalyst than Pt-gypsum.[4] It yields purer crude (*i*) than that obtained with V_2O_5[4] or Pt-gypsum at 300°-500° C.

Thus the order of activity of the catalysts : partially-dehydrated gypsum,[4] Fe_2O_3-gypsum, Pt-gypsum and V_2O_5 : with respect to the purity of crude (*i*) produced is :

Partially-dehydrated gypsum > Fe_2O_3-gypsum > Pt-gypsum > V_2O_5.

Impregnation of gypsum with Fe_2O_3 or Pt does not increase its dehydrogenation power.

At 500° C., Fe_2O_3-gypsum catalyst exercises an aggressive effect on carene and yields over two and a half times the quantity of gaseous products than that obtained with partially-dehydrated gypsum.[4]

Lower fractions boiling from 120° C. to 173° C. give positive tests for (*i*) as evidenced by the formation of terephthalic acid when the samples are oxidised by chromic acid. Refractionation improved the yield of crude (*i*) by 30%.

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Lahore, BHARAT BHUSHAN.
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* The word 'carene' is purposely used. There is evidence that natural Δ^3 - carene is not quite homogeneous.[5,6,7]

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ON SOME PHYSIOLOGICAL PROPERTIES OF EXTRACTS OF WHEAT GRAINS

THE conditions generally necessary for successful seed germination are sufficient moisture as well as aeration and an appropriate temperature. According to Nelson[1] some kinds of seeds, *e.g.*, carrot and parsley, tolerate and indeed benefit from presoaking for 24 hours or even more, whereas a mass of soaking beet seeds can poison themselves in quite a short time unless the water is frequently changed. Evidently release of a poisonous substance from the seed is indicated. Duym, *et al.*[2] conclude, however, that the inhibiting effect of the extract from the seed balls of sugarbeet on the germination of Avena seeds is mainly due to the osmotic pressure of its salt content. Bonner, *et al.*[3] have found that the water extract of peas contains a leaf growth hormone. It now appears to be definitely established that seeds of maize, barley, rye and wheat contain free auxin (*cf.* Hatcher,[4] Avery, *et al.*,[5] Haagen-Smit, *et al.*[6]), which diffuses out into water medium.

The presence of salts or hormones in the water extract of seeds has interest from another point of view. It has been reported by Henkel, *et al.*[7] and also by Chinoy[8] from this laboratory that drought resistance is induced by alternately soaking wheat grains in water and drying prior to sowing. In view of the findings referred to above it is quite likely that some substances diffuse out from the seeds during soaking in water. With a view to investigating the causes underlying this effect of the water-soaking treatment we considered it worth while in the first instance to examine the properties of water extracts of wheat grains. Some of the observations made during the course of this study appear interesting and an account of the same is presented here.

Preliminary observations indicated that whereas the water extract of seeds of *T. Vavilovi* retarded the growth of the main root of germinating seeds of maize and wheat (sown in sand and moistened with extract), that from seeds of another variety, *viz.*, N. P. 165 had no such effect. A study of a number of varieties was, therefore, undertaken. As a test object the main roots of 15 germinating maize—var. Pusa yellow—seedlings (about 48 hours from sowing at room temperature when the main root was about 1·5 cm. long) were used. The seedlings were kept in petri-dishes with roots immersed in about 20 c.c. of distilled water or the extract and the lengths of the main roots

TABLE I

Test period in hrs.	Variety	Root growth in cm.			
		Distilled water	Extract	Ashed extract	
15	Khapli	3·17±0·15	1·06±0·04	3·0 ±0·15	
,,	N.P. 165	,,	2·76±0·14	3·25±0·22	
		Distilled water	Extract (original)	Ether Extract	Residue insoluble in ether
18	Khapli	3·80±0·16	2·44±0·14	2·91±0·29	2·51±0·16
		Distilled water	Extract	Extract dried at 80° C.	
18	Khapli	3·80±0·38	2·44±0·14	2·40±0·11	

were measured again after about 15 hours. The difference in the growth made during the test period in distilled water and in the extract indicated the presence as well as strength of the inhibiting substance or substances. Except during actual measurement of length, the seedlings were always kept in the dark at room temperature. Temperature during the test period was not controlled and the test period also varied from 15 to 18 hours according to convenience. Since most observations are comparative these defects in the technique may not seriously affect the validity of the results.

The extract was obtained by soaking 200 or 10 gm. of air dry seeds in 30 c.c. of freshly boiled (and cooled) distilled water for 3 hours at room temperature. Before soaking, the seeds were washed 12 times with tap water, 8 times with distilled water, for 2 minutes with rectified spirit and finally 6 times with freshly boiled and cooled distilled water.

In Table II, column 5, are presented the results of tests with nine varieties of wheat from which it appears that extracts of *T. Vavilovi* and Khapli alone contained the inhibiting substance. The depressing effect of auxin on root growth is well known. Experiments were, therefore, undertaken to see what type of substance in the extract inhibited root growth. Seeds of Khapli alone were used for detailed study as it is difficult to raise a good crop of *T. Vavilovi* under Delhi conditions.

It was found on evaporating the extract to dryness on the water-bath that a brown sticky syrup with a sweet smell was left as a residue indicating caramelisation of sugar. The presence of sugar in the pea extract has been reported by Bonner, *et al.*[3] Root growth was, however, not retarded in 1% sucrose solution during the usual period.

That the inhibiting effect of the extract was not due to its salt content was determined by ashing the extract and testing the aqueous solution of the ash (*cf.* Table I). Apparently some organic substance other than sugar inhibited root growth, The data in Table I indicate that it was possible to extract the substance with ether, although not completely, from the dry extract. Data in Table I also indicate that the substance was thermostable (up to about 80° C.).

Split coleoptiles gave an inward curvature when immersed in the extract as they usually do under the influence of auxin. The roots grown in the extract also appeared thicker (*cf.* Thimann[9]). It is, therefore, presumed that the growth-inhibiting substance in the extract is hormonal in nature and is probably free auxin.

The difference between the varieties still remained to be accounted for. According to

TABLE II

Test period in hours	Variety	Days from sowing to flowering	Growth in cm.		
			Distilled water	Ordinary seed	Punctured seed
18	*T. Vulg.* N.P. 165	90	3·38±0·20	3·31±0·17	0·97±0·07
14	*T. Vulg.* C 13	90–100	2·77±0·22	2·16±0·17	1·45±0·05
,,	*T. Pyramidale*	110–120	2·77±0·22	2·39±0·20	0·99±0·12
15	*T. Dicoco.* Mindum	120–130	2·37±0·14	2·15±0·24	0·84±0·08
14	*T. Durum* Kubanka	130–140	1·95±0·24	2·09±0·09	0·50±0·06
17	*T. persicum* Persian Black	140–150	2·28±0·23	1·76±0·17	0·63±0·09
14	*T. Poloricum*	150–160	1·95±0·24	1·83±0·16	0·63±0·05
15	*T. Dicoco.* Khapli	100–110	2·77±0·15	1·22±0·07	..
16	*T. Vavilovi*	160–170	3·22±0·14	2·03±0·13	..

Hatcher,[4] in the rye grain the major proportion of auxin is concentrated in the aleurone layer. Seeds of the varieties whose extracts did not inhibit root growth were, therefore, soaked in water for about half an hour just to soften them and were then pricked at four places near the embryo with a pin with a view to puncturing the aleurone layer and testa. Extracts from such seeds were found to contain the inhibiting substance as seen from data in Table II, column 6.

It is evident from the data above that the inhibiting substance does not diffuse through the aleurone layer or testa (whereas salts and sugar do) when seeds of these varieties are extracted with water at room temperature —about 95° F. That the inhibiting effect was not due to salts was ascertained by testing the ashed extract.

It was possible to extract this substance by treating seeds of NP 165 with water at a temperature of about 80°C. on a water-bath for about half an hour. Evidently the aleurone layer and the testa became more permeable at this temperature. Conversely when seeds of Khapli were extracted with water at a lower temperature—about 50°F.—they yielded a much smaller quantity of the inhibiting substance.

In conclusion, the differential effect of water-soaking treatment at room temperature on the release of a hormone-like substance –presumbly auxin—from grains of different wheats, as estimated by the 'root' test, is emphasized. It is possible that the more delicate 'Avena' test —which could not be carried out for want of equipment—might detect the presence of the hormone in extracts of those seeds which gave a negative result with the 'root' test. It is, however, felt that the quantitative difference in the yield of the substance between varieties would still persist. How far this differential effect would influence the subsequent performance of the varieties under different environments would appear to be worth consideration.

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THE SPECTRUM OF IODINE VII

ABOUT a decade ago, L. and E. Bloch and Felici[1] published a long list of lines due to highly excited Iodine in the region λ 200 to λ 1,000. They divided their data however, into seven groups denominated 2−, 2, 2+, 3−, 3, 3+ and 4, but not into I, II, III, IV groups familiar in spectroscopic notation. From group 4, they picked up two lines ν 515060 and ν 525925 and identified them as due to I VIII. Starting with the clue that their data contains lines of I V, VI and VII too, the writer made an attempt to pick up from the same, the doublets of I VII by way of partly clearing up the data for the solution of I III and I IV, which are in progress in this laboratory.

Table I, which shows the application of the so-called Irregular Doublet Law, helped in the identification.

TABLE I

Corresponding lines in Ag I-like spectra.

Spectrum	$5s^2S_{\frac{1}{2}} - 5p^2P_{\frac{1}{2}}$	$5s^2S_{\frac{1}{2}} - 5p^2P_{1\frac{1}{2}}$	$5p^2P_{\frac{1}{2}} - 5d^2D_{1\frac{1}{2}}$
In III	57185	61527	71273
Sn IV	69559	76077	95738
Sb V	81566	90554	120341
Te VI	93336	105151	144745
I VII	104960	119957	169059

of three lines and Hartley's Law, to fix up a fourth *i.e.* ν 154055 .

TABLE II

Doublets of I. VII.

$5p$	$^2P_{\frac{1}{2}}$		$^2P_{1\frac{1}{2}}$	
$5s\ ^2S_{\frac{1}{2}}$	104960	(5)	119957	(6)
$5d\ ^2D_{1\frac{1}{2}}$	169059	(4)	154055	(20)
$^2D_{2\frac{1}{2}}$			156294	(6)

Further support to the scheme presented in Table II is afforded by the fact that the two intervals $5p$ ($^2P_{\frac{1}{2}}$—$^2P_{1\frac{1}{2}}$) and $5d$ ($^2D_{1\frac{1}{2}}$–$^2D_{2\frac{1}{2}}$) obey the law of screening constants. The line ν154055 (20) is of abnormal intensity but is found to represent also the combination, $5p^3P_2 - 5d^3D_3$ in I VI.

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A NOTE ON CARP OVA AND THEIR HATCHING

IN the river Halda of Chittagong, East Bengal, millions of ova of *Catla catla* (Hamilton), *Labeo rohita* (Hamilton) and *Cirrhina mrigala* (Hamilton) are collected in various stages of development and are hatched in specially prepared hatchery pits excavated