High Yield and Adaptability of New Oat Varieties in Different Regions

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National Oat Regional Test

- National Oat regional test is managed by National Agricultural Technology Extension and Service Center, Ministry of Agriculture.

- This test is performed by the Inner Mongolia Academy of Agriculture and Husbandry Sciences.

National Oat Regional Test

- The purpose of the national oat regional test is to assess new oat varieties (lines) under different ecological conditions, and screen varieties with high yield, adaptability and resistance, and provide a scientific basis for the new oat variety identification and extension.

National Oat Regional Test

- Naked Oat regional test started from year 2000,covered oat from year 2006. Each test for three years.

- By now, Naked Oat regional test carried out to the fifth, year 2012 is the first year of the fifth test; and covered oat to third, year 2012 is the first year of the third test.

Number	Naked oat（year）
First	2000-2002
Second	2003-2005
Third	2006-2008
Fourth	2009-2011
fifth	2012-2014

Number	Covered oat（year）
First	2006-2008
Second	2009-2011
Third	2012-2014

National Oat Regional Test

Mengyan 1

蒙燕一号

- By now, the bayou3, mengyan1 ,baiyan7, bayan1 were screened through the national oat regional test, and identified through the National Examination Committee. These varieties with high yield and good stability.

农作物品种鉴定
证 书

鉴定编号: 国品鉴杂 2010026
作物种类: 燕麦
品种名称: 蒙燕 1 号
选育单位: 内蒙古自治区农牧业科学院
品种来源: 永 492/80－13
鉴定意见: 该品种于 2006～2008 年参加全国农业技术推广
服务中心组织的全国小宗粮豆品种试验，2010 年 1 月经全国小
宗粮豆品种鉴定委员会鉴定通过。建议在内蒙古武川，吉林白城，
河北张北、崇礼，新疆奇台推广种植。

证书编号: 2010-1-42   二〇一〇年 月 三日

北京·全国农业技术推广服务中心   100026

Test Data Sources

- In this study, the fourth test data of naked oat and the second test data of covered oat were used to analyze the stability and adaptability of new varieties

The Fourth Test of Naked Oat

- The fourth test of naked oat started from year 2009 to year 2011

- Including nine naked oat varieties.The varieties were provided by the breeding unit, unified management by the Inner Mongolia Academy of agriculture and husbandry.

yy02-80	H44	Yan 2007 燕2007
9620-4	W04-96	W85
Bayou11 坝莜11号	Xiyou1 西莜1号	Bayou3(ck) 坝莜3号

The Fourth Test of Naked Oat

----the distribution map of test sites

第四轮国家燕麦（裸）品种区域试验试点分布图

乌鲁木齐
白城
克什克腾
张北
武川
张家口
右玉
五寨
会宁 固原
西宁 定西
合作
昭觉 昭通
南海诸岛
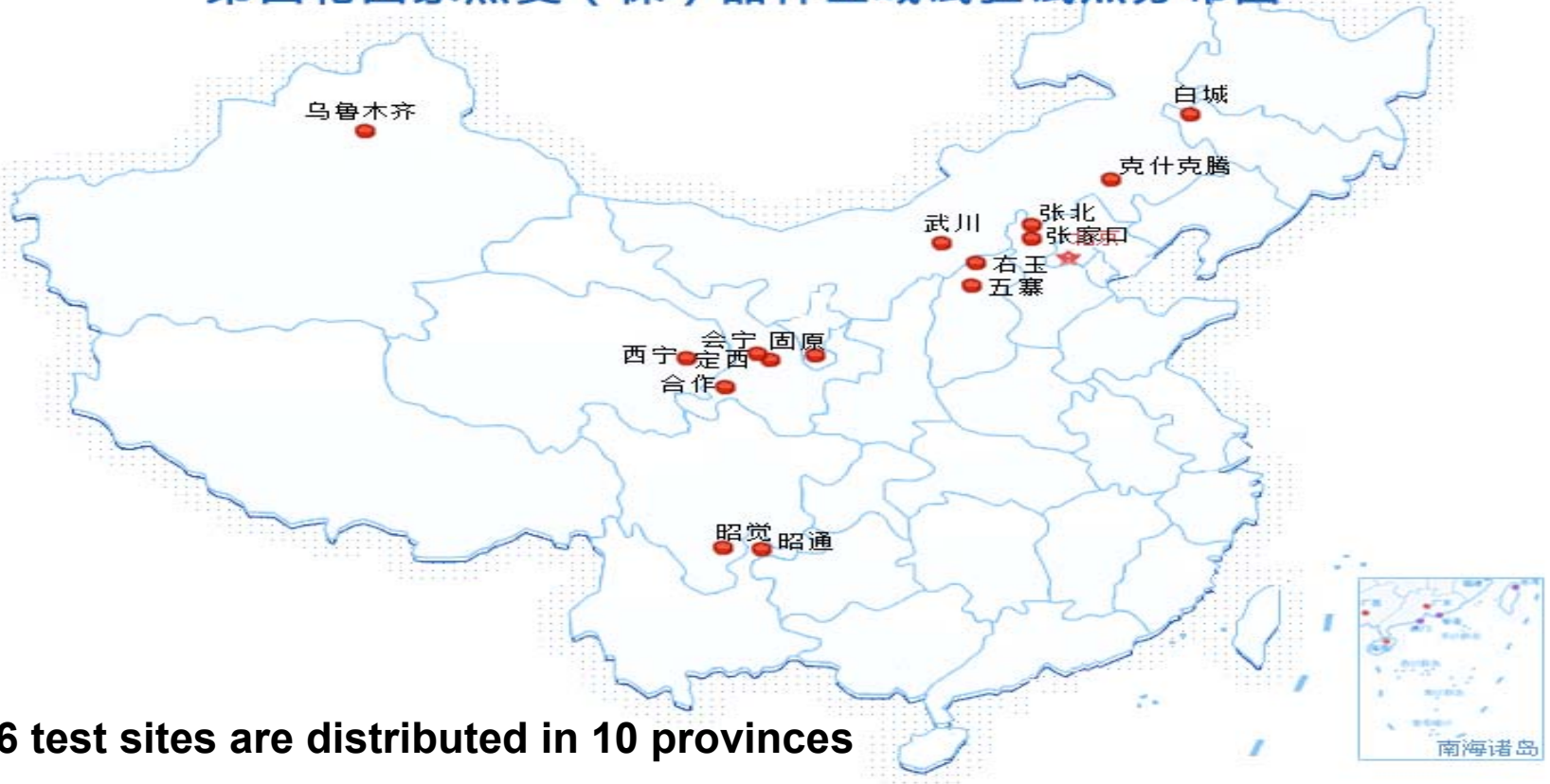
16 test sites are distributed in 10 provinces

The Second Test of Covered Oat

- The second test of covered oat started from year 2009 to year 2011

- Including seven covered oat varieties (lines)

Qingyin1 (青引1号) (CK)	W04-90	Bayan4 (坝燕4号)
Xiyan2 （西燕2号）	Jizhangyan4 冀张燕4号	Bayan4 巴燕4号
R3		

The second test of covered oat

----the distribution map of test sites

第二轮国家燕麦（皮）品种区域试验试点分布图

乌鲁木齐

白城

克什克腾

武川

张北
张家口

西宁
合作

南海诸岛

8 test sites are distributed in 6 provinces

Analytical Methods

- The regional test was conducted at many test sites for many years, Influenced by many factors, the interaction between factors.

- At present, the arithmetic mean method was used for analysis of regional test data. But the calculation of the arithmetic mean method is cumbersome, and did not consider the environmental and genetic interactions, can not accurately evaluate the high yield and stability of the varieties.

Analytical Methods

- the use of effective methods of statistical analysis, help to fully analyze the test data to make objective and comprehensive evaluation to the varieties.

- Therefore, we used the GGE software to analyze the fourth test data of naked oat and the second test data of covered oat.

Analysis Software-GGE biplot

- GGEbiplot software is founded by Pro. wei kai yan ,who is oat breeding expert, from Canadian ministry of Agriculture.

- In 2009, the chief expert of oats of china invited Dr. Yan to Bai cheng, training the team members of the oat system. I attended a training course, learning the use of the GGE software.

Dr. Weikai Yan

training

Analysis Software-GGE biplot

- GGE -biplot method is a new analysis way of multi-factor interactions.

- GGE-biplot can clearly identify high-yield, stable yield varieties and the test sites with effective resolution using chart, so GGE-biplot is considered to be the ideal method of analysis of regional test data.

The Average Yield and Stability of the varieties -naked oat

- From the Visualization menu bar, choose Show Average Tester Coordinate. An average tester coordinate (ATC) based on the average environment will appear (Fig.). The ATC x-axis passes through the biplot origin and the marker of the average environment, which is defined by the average PC1 and PC2 scores over all environments. The oval indicates the positive end of the ATC x-axis. The ATC y-axis passes the plot origin and is perpendicular to the ATC x-axis. The average yield of the varieties is approximated by the projections of hei markers to the ATC x-axis.
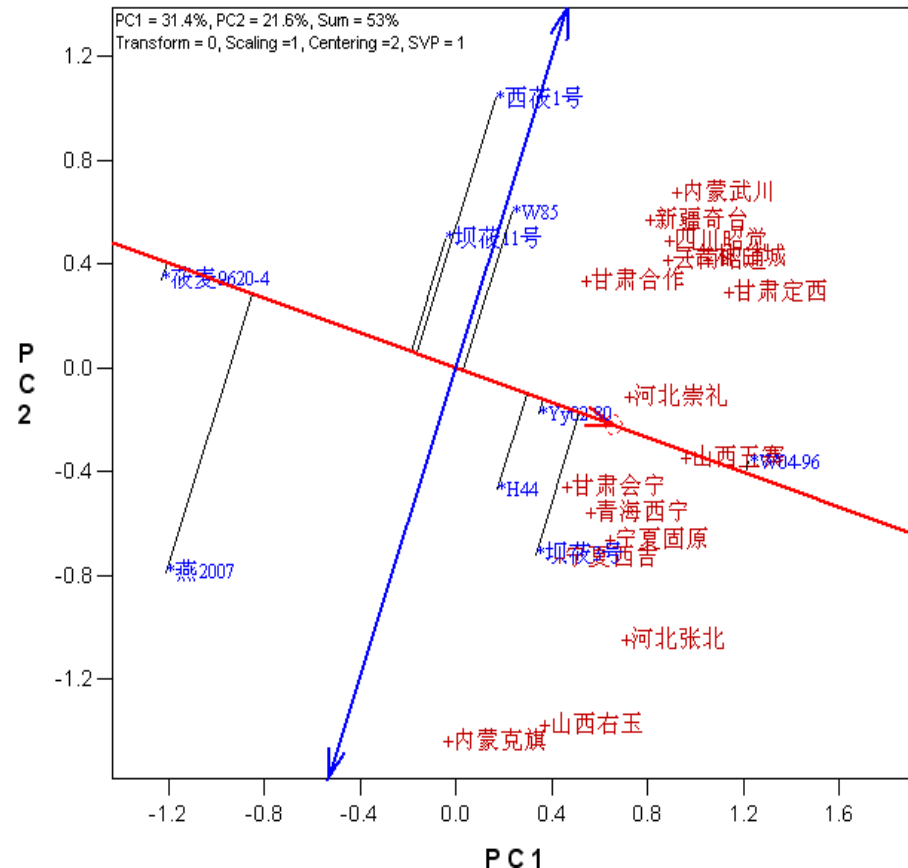
# The Average Yield and Stability of the varieties -naked oat

Thus, varietie W04-96 had the highest average yield, and 9620-4 had the lowest.

The stability of the cultivars is measured by their projection to the ATC y-axis. The greater the absolute length of the projection of a cultivar, the less stable it is. Thus Yan2007 and Xiyou1 were the least stable cultivar while W04-96 and YY02-80 were the most stable.
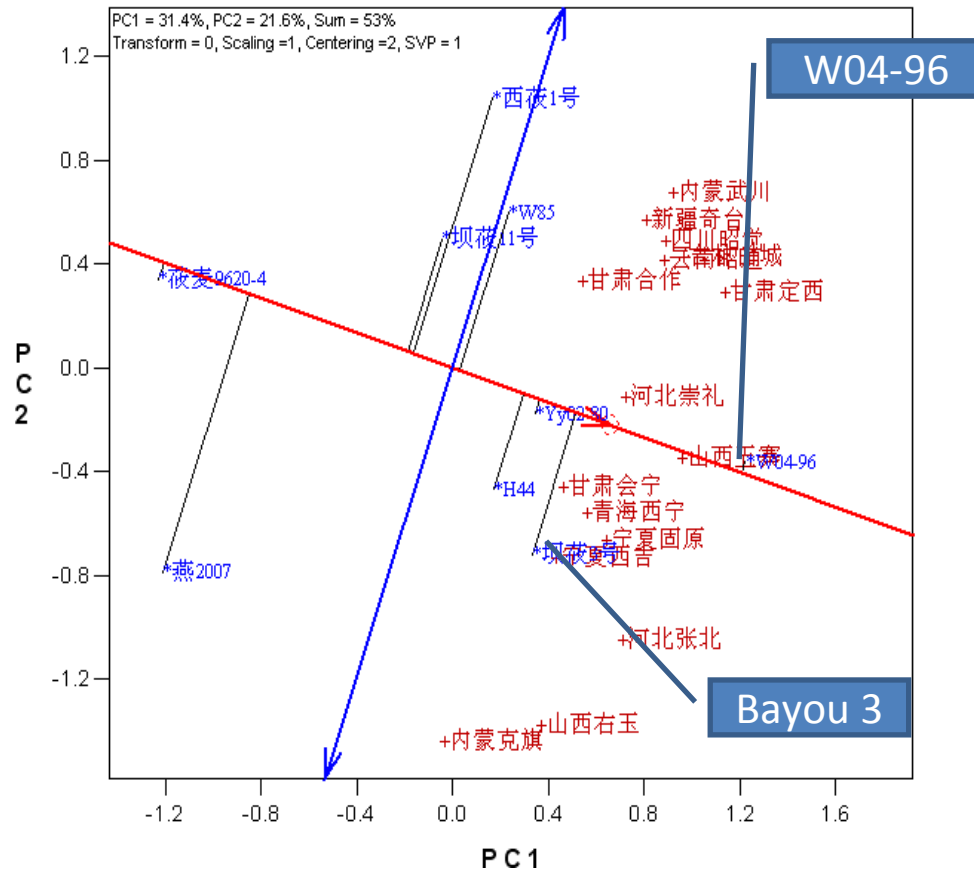
The Best Cultivar in Each Environment

From Visualization menu bar, choose Draw Convex Hull. The GGE biplot will become like Fig. . The convex hull in Fig. is drawn on cultivars relatively remote from the biplot origin so that all other cultivars are contained within the convex hull. Figure also contains a set of lines perpendicular to each side of the convex hull. These perpendiculars divide the biplot into several sectors, and the environments inevitably fall into the sectors.
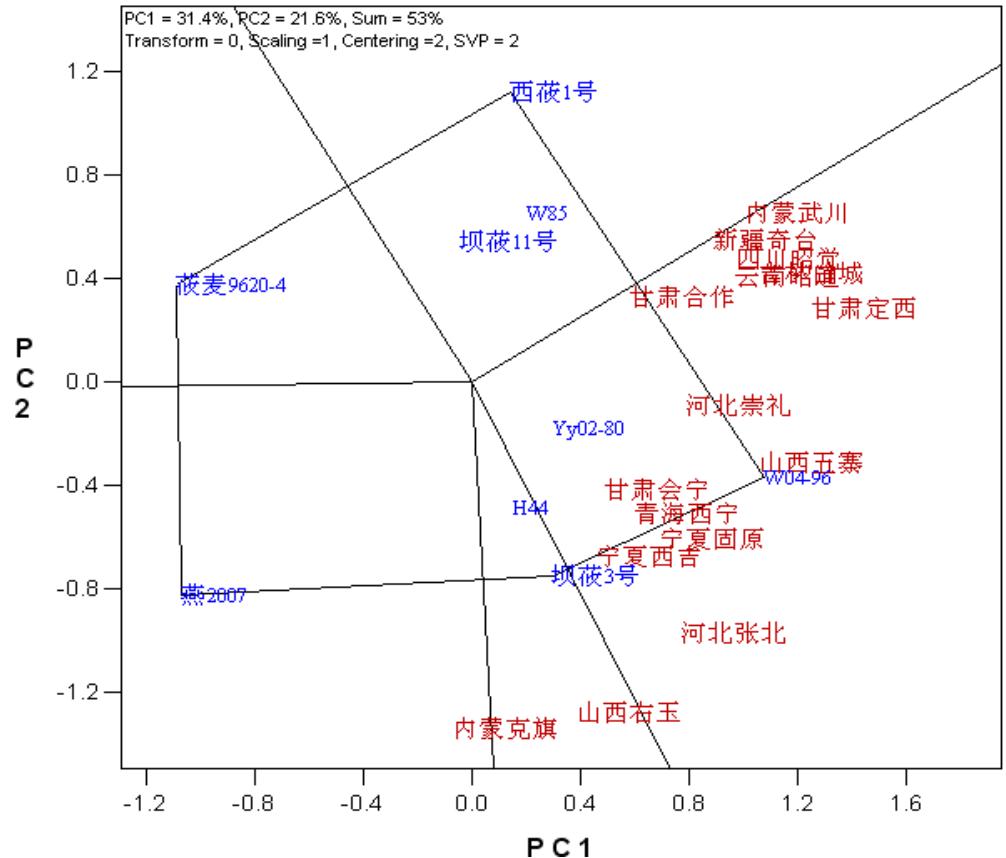
# The Best Cultivar in Each Environment -naked oat

- There are five sectors in Fig., with cultivars xiyou 1, 9626-4, Yan2007, Bayou 3, and W04-96 as vertex cultivars. Almost all Environments, not including Keqi and Youyu), fell in the sector in which W04-96 was the vertex cultivar. This means that W04-96 was the best cultivar for Almost all Environments.
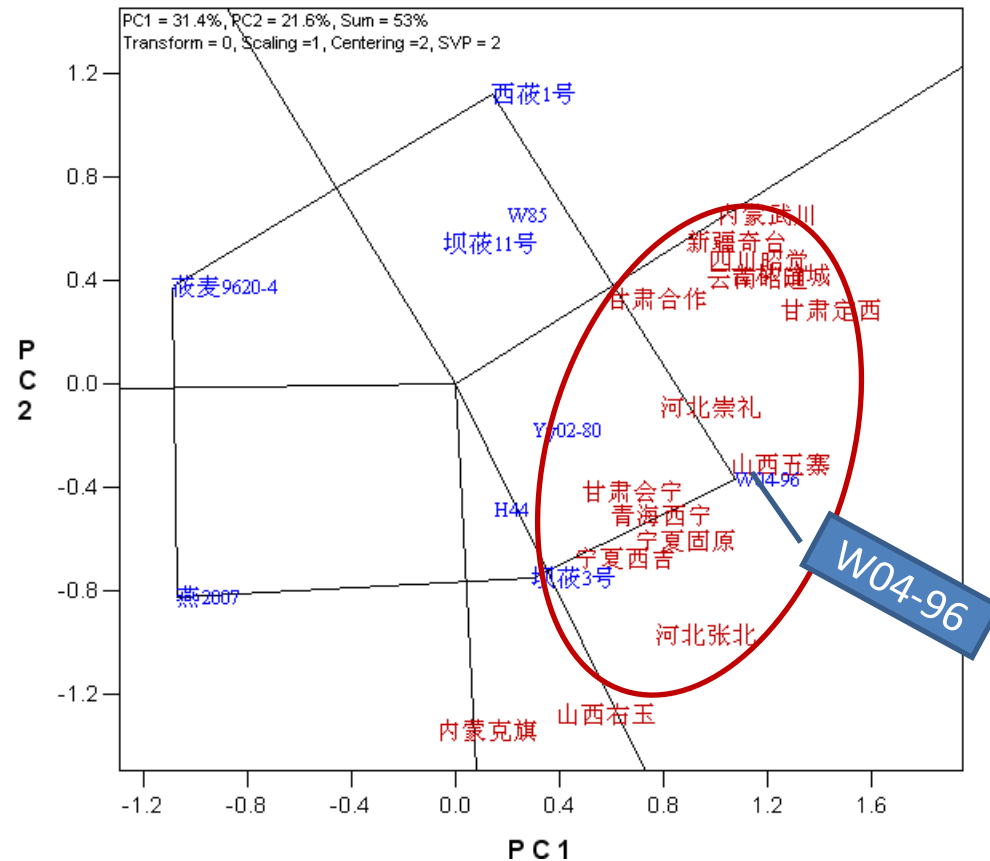
Differences Between Years -Naked Oat

There are five sectors in Fig., with cultivars Yyo2-80, 9626-4, Yan2007, Bayou 3, and W04-96 as vertex cultivars. Year 2010 and 2011 fell in the sector in which W04-96 was the vertex cultivar. This means that W04-96 was the best cultivar in 2010 and 2011 the difference of its yield between years was small.
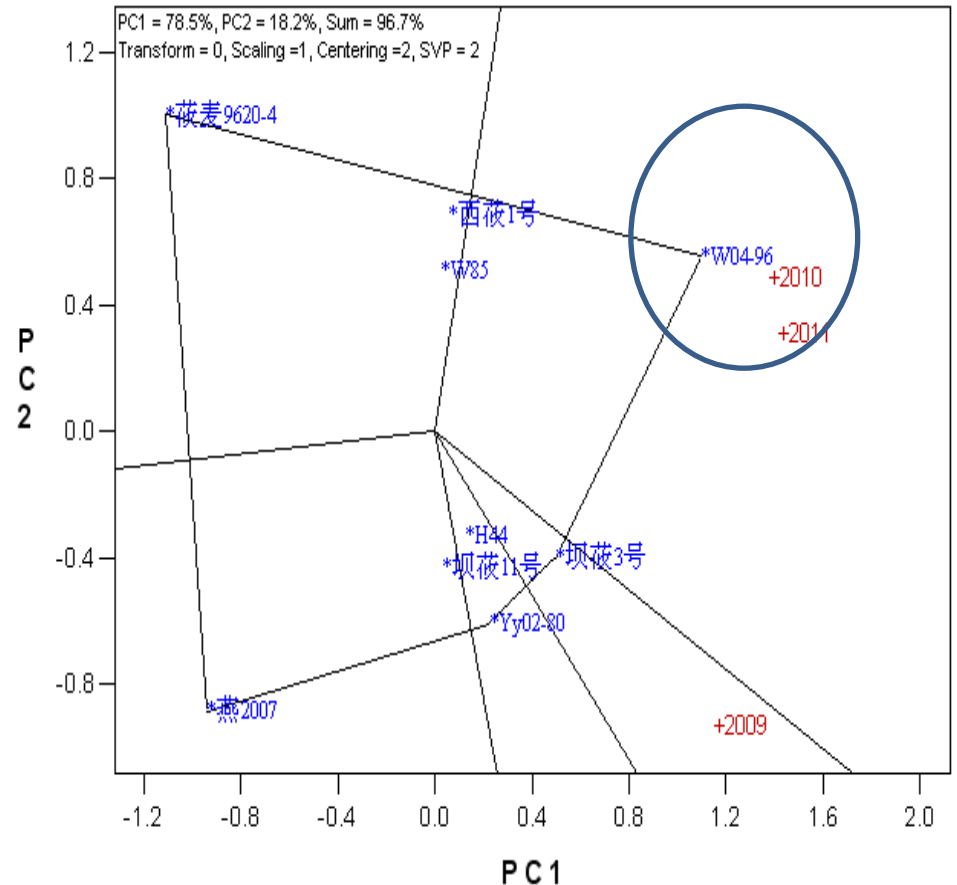
Correlation Between Traits and Yield - naked oat

- The cosine of the angle between the index vector and the adjacent index can represent their correlation.

- As can be seen from the graph, the yield and grain weight were significantly associated
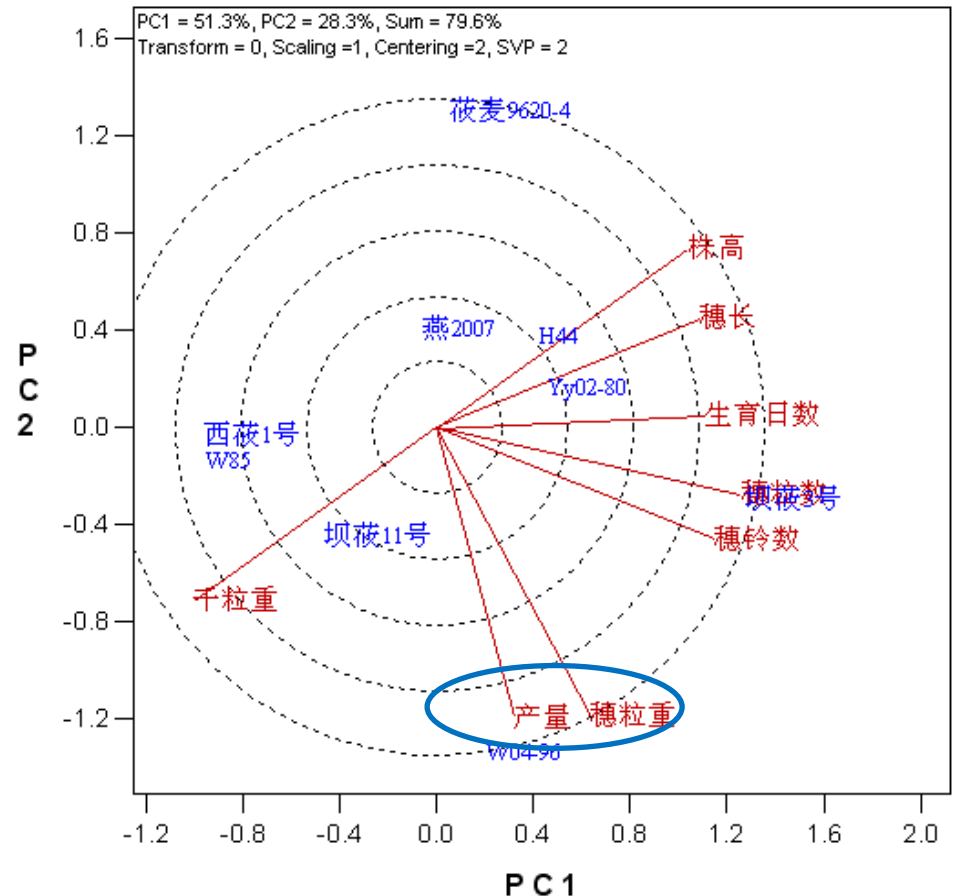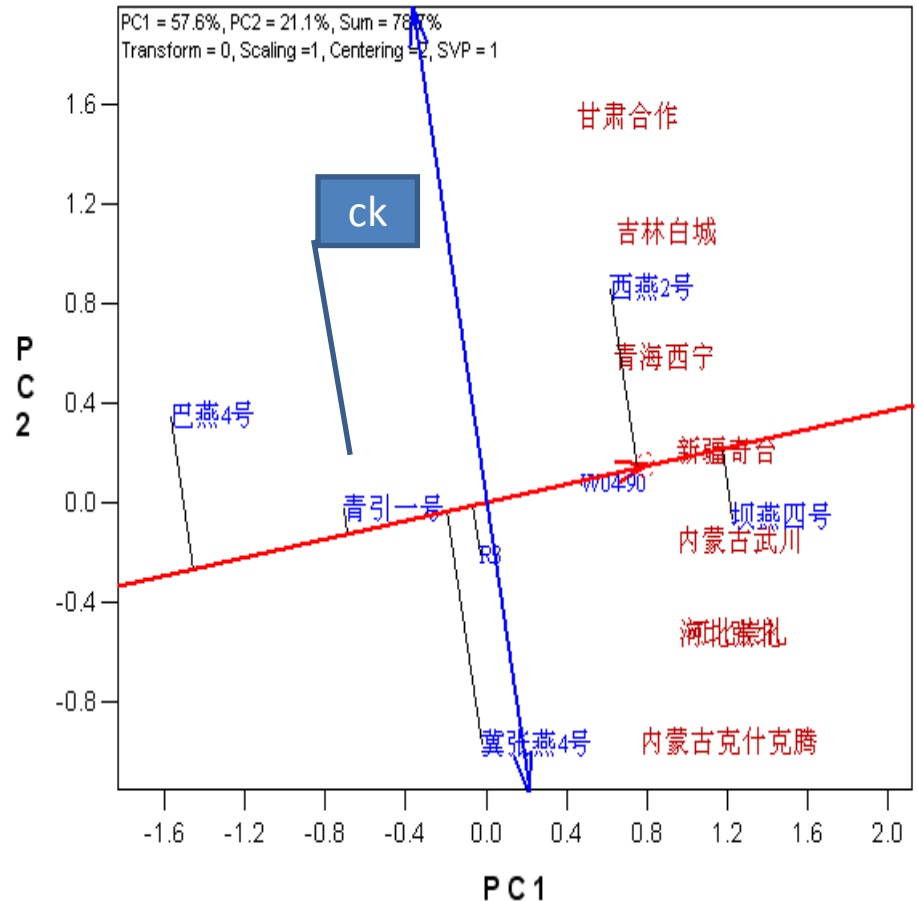
The Average Yield and Stability of the varieties -Covered oat

It can be seen from the chart, varietie Bayan4 (坝燕4号) had the highest average yield, and Bayan 4（巴燕4号） had the lowest.

Jizhangyan 4 was the least stable cultivar while W04-90 were the most stable.

Qingyin1 was a stable low-yield varieties. So we changed ck for mengyan 1 in next test.


PC1 = 57.6%, PC2 = 21.1%, Sum = 78.7%
Transform = 0, Scaling =1, Centering =2, SVP = 1

ck

甘肃合作
吉林白城
西燕2号
青海西宁
新疆奇台
巴燕4号
坝燕四号
内蒙古武川
青引一号
W04-90
R3
河北蔚礼
冀张燕4号
内蒙古克什克腾

PC2

PC1

The Best Cultivar in Each Environment - covered oat

- There are four sectors in Fig., with cultivars Xiyan2, Bayan4（巴燕4号), Jizhangyan 4, Bayan4(坝燕4号) as vertex cultivars. Hezuo Bacheng and Xning fell in the sector in which Xiyan2 was the vertex cultivar. This means that Xiyan2 was the best cultivar for Hezuo Bacheng and Xning
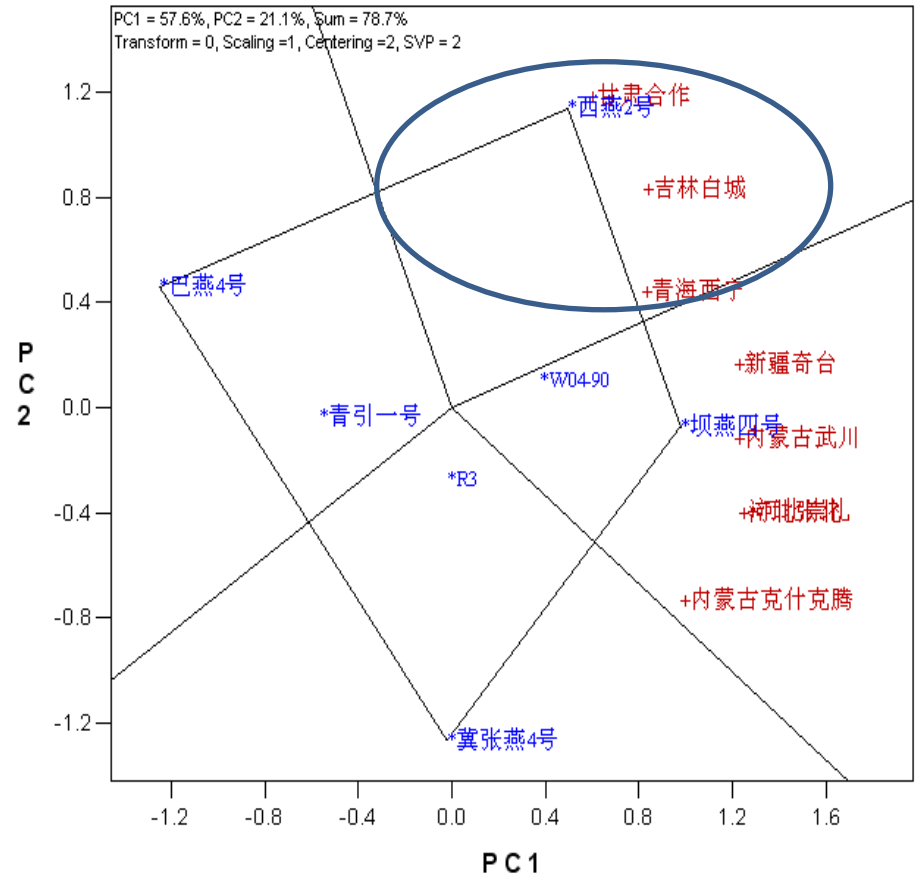
The Average Yield and Stability of the varieties -Covered oat

- Qitai, Wuchuan, Chongli, Zhangbei and Keqi fell in the sector in which Bayan 4 as the vertex cultivar. This means that Bayan 4 was the best cultivar for Qitai, Wuchuan, Chongli, Zhangbei and Keqi

PC1 = 57.6%, PC2 = 21.1%, Sum = 78.7%
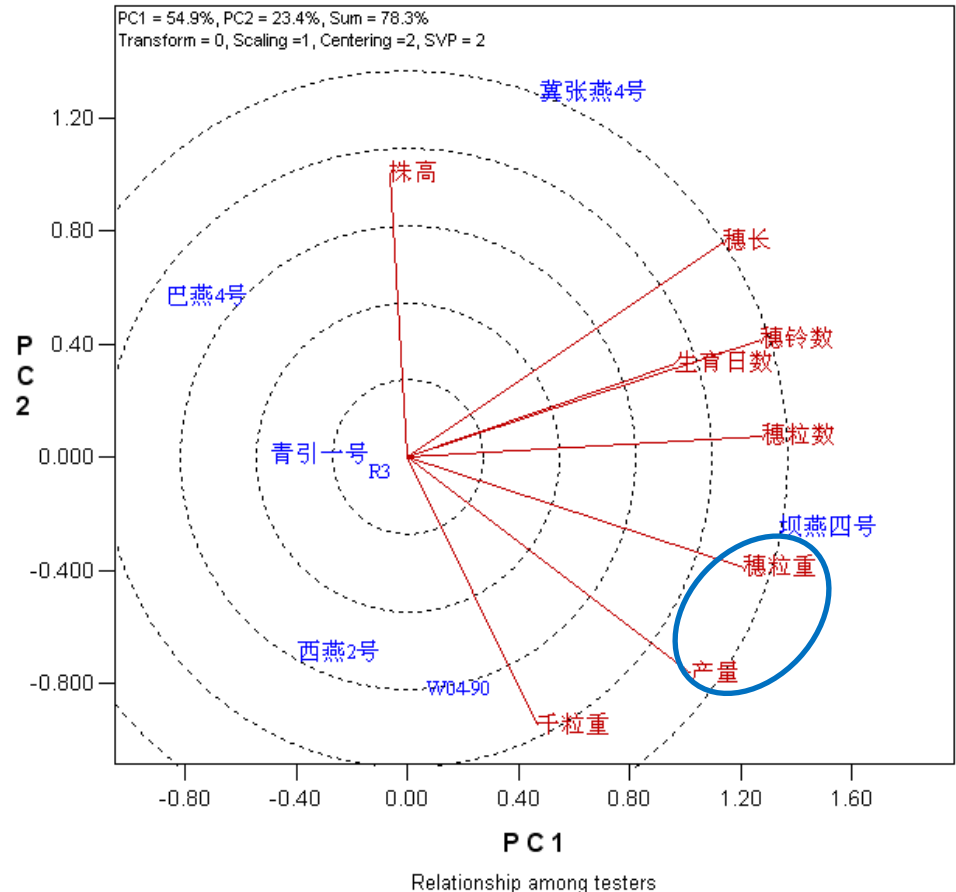Transform = 0, Scaling =1, Centering =2, SVP = 2
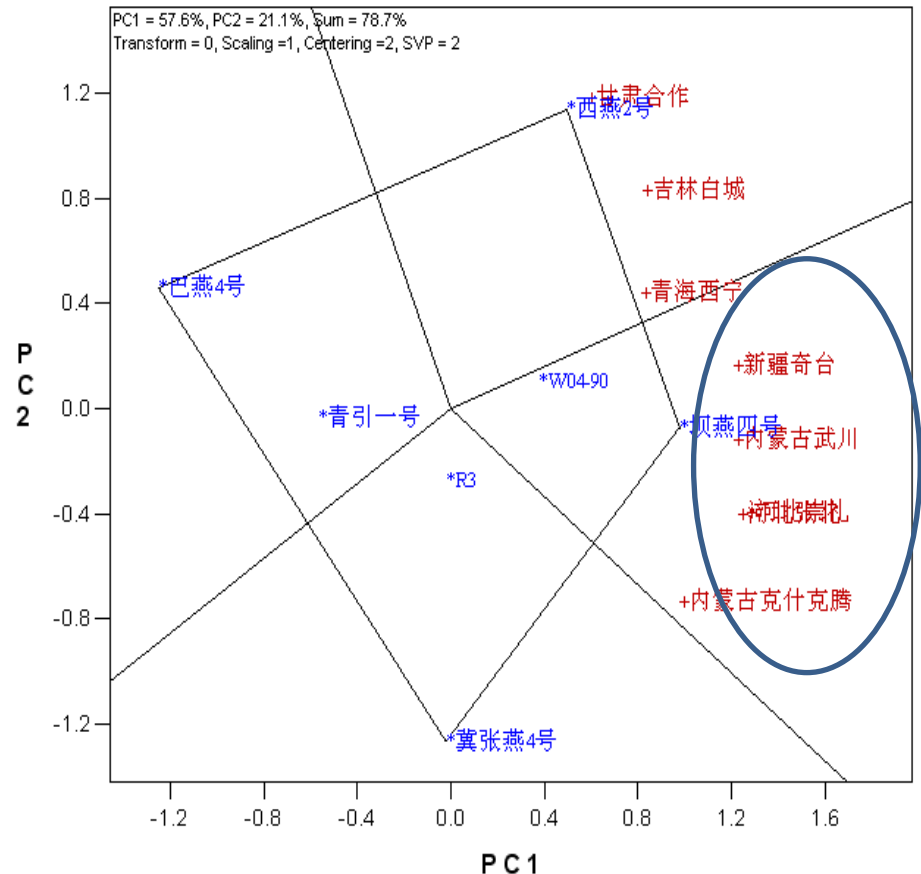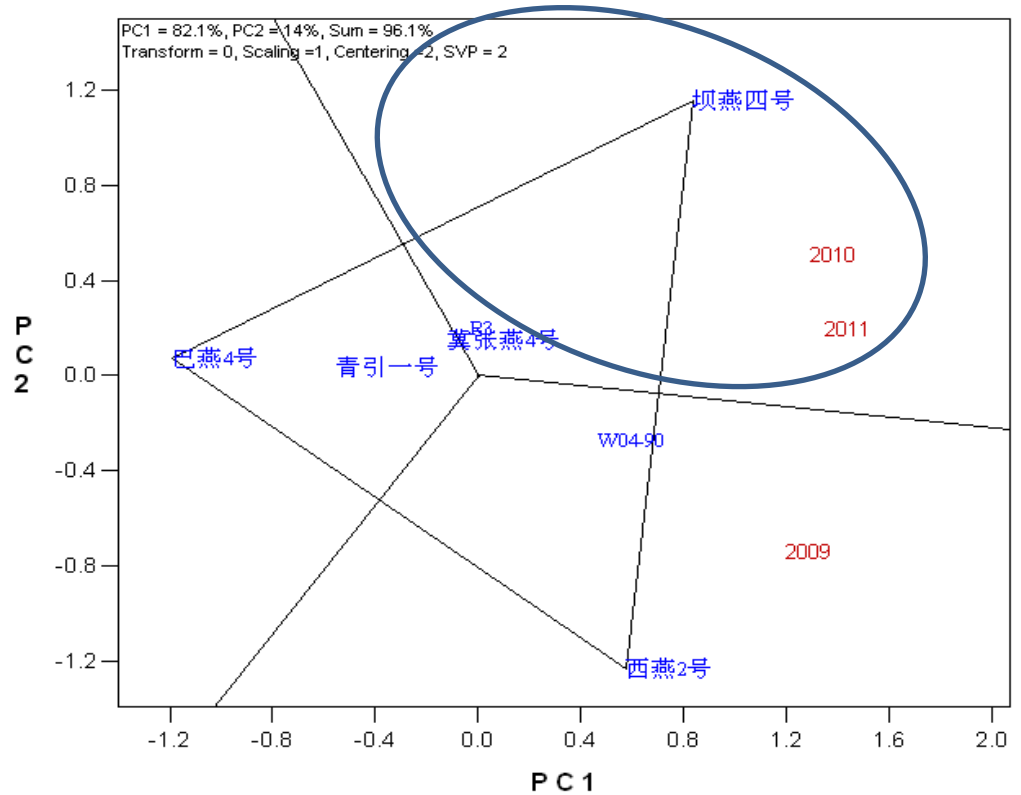
Correlation Between Traits and Yield -- covered oat

As can be seen from the graph, the yield and grain weight were significantly associated.

This result is same with the result of naked oat.

Relationship among testers

Differences Between Years
- covered oat

Yield of BaYan4 was higher in 2010 and 2011; the difference of its yield between years was small.

Summary

- Nine lines of naked oat were tested in sixteen sites, and seven lines of covered oat were tested in eight sites. The results showed that W04-96, BaYan4, had higher yield and better yield stability than other lines.

- Yield of W04-96, BaYan4 was higher in year 2010 and year 2011; the difference of their yield between years was small. Grain weight of them was higher.

Summary

- The results showed the correlation between grain weight and yield was significantly.

- This study demonstrates that GGE biplot is simple and effective method for analyzing stability and adaptability of varieties and the difference of yield between years

Acknowledgements

- thanks Pro. Yan for providing GGE biplot software to us.

Thank you for your attention