

영남작물시험장                      양의식, 박경배, 정연태, 이재생  
 맥류연구소                         강양순

An investigation on the possibility of didused mine in Yeongnam area for agricultural use

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<실험 목적>

이용가능 폐광의 본포, 기상환경을 조사하여 농산물 저장 가능성을 조사함과 아울러 가각조절용 대형 인공 동굴 설계시 기초자료로 활용하고자 함

<재료 및 방법>

(시험 1) 폐광산 본포 및 년차간 계절간 환경조사

- 폐광본포 조사지역 : 경.남북
- 이용가능 폐광 기상환경조사지역 : 경남 함안, 밀양('88. 5 - '89 10월)
- 폐광의 농가 이용실태 조사지역 : 경북 경산, 충남 서천, 홍성

(시험 2) 폐광이용 농산물 저장방법 모색

- 공시작목 : 감자(수미), 고구마(황미)
- 저장기간 : 감자; 5개월 ('89.7 - 12월), 고구마; 4개월 ('89. 11 - '90. 3월)

<결과 및 고찰>

1. 영남지역에 분포되어 있는 폐광산 수는 총 502개 이었고 그중 대부분이 비금속광으로 붕괴 위험 및 노천광이었기 때문에 활용가치가 없었으나, 이중 활용가능한 것은 약 3.3%정도 있었음.
2. 폐광내 기온은 최고온도가 13.3-14.0°C, 최저온도가 12.3-13.2°C로 년중 항온이 유지되었으나 경구에서 내부로 들어갈수록 다소 높아졌으며 상대습도는 94.5-97.0%로 매우 높았음.
3. 폐광의 경구방위별 갱내기온은 북북서 방향이 남남서 방향보다 다소 낮았고 폐광의 측구유무에 따른 갱내 기온은 측구가있는 폐광이 없는 폐광에 비하여 계절간 변이가 크나 5-10월 사이에는 기온이 낮아 농산물 저장시는 측구가 있는 광이 유리할 것으로 조사되었음.
4. 폐광(터널, 인공굴)은 농기에서 버섯재배 및 젓갈류 숙성용으로 이용되었으며 버섯재배시는 노지재배에 비하여 재배기간의 연장(1-2개월) 및 시설비 절감, 젓갈류 숙성시는 품질향상의 효과가 있었음.
5. 폐광을 이용한 감자와 고구마 저장은 간이저장 시설에 비하여 멍아발생율, 부패율 및 감모율이 낮아 활용가치가 컸음.

Table. Distribution of mines in Yeongnam area

Province	Kinds of mine	No. of mines			No. of usable cave for storage
		Total	Active	Inactive	
Kyeonbuk	Metal mine	80	7	53	5
	Non-metal mine	193	102	91	-
	Coal mine	42	32	10	1
	Sub total	295	141	154	6
Kyeongnam	Metal mine	98	12	86	9
	Non-metal mine	518	262	256	-
	Coal mine	6	-	6	-
	Sub Total	622	274	348	9
Total		917	415	502(100)	15(3.0%)

Table. Difference of temperature in the mine according to the distance from south direction of the cave

Distance from mine mouth (m)	Temp. Direction of cave	'88												'89																																															
		May												June												July												Aug.												Sept.											
		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.																								
3m	Max.	S S W	13.0	13.5	14.5	15.1	14.8	15.0	14.7	14.9	13.9	12.9	13.1	13.2	N N W	11.7	12.5	13.3	13.7	13.3	13.5	13.6	12.7	13.2	13.1	13.0	12.6	S S W	11.8	12.5	13.9	14.7	14.3	14.4	13.8	13.6	12.6	12.6	12.7	12.4	N N W	10.2	11.7	12.2	13.1	13.0	13.0	11.6	12.5	12.0	12.1	12.2	12.3								
	Min.	S S W	11.8	12.5	13.9	14.7	14.3	14.4	13.8	13.6	12.6	12.6	12.7	12.4	N N W	10.2	11.7	12.2	13.1	13.0	13.0	11.6	12.5	12.0	12.1	12.2	12.3	S S W	11.8	12.5	13.9	14.7	14.3	14.4	13.8	13.6	12.6	12.6	12.7	12.4	N N W	10.2	11.7	12.2	13.1	13.0	13.0	11.6	12.5	12.0	12.1	12.2	12.3								
50m	Max.	S S W	15.3	14.1	14.4	15.0	15.1	14.7	15.0	14.9	14.6	13.5	14.4	13.7	N N W	12.3	13.2	13.1	13.3	13.2	13.8	13.1	12.7	13.4	13.4	13.1	13.2	S S W	12.7	13.4	13.9	14.4	14.3	14.4	14.2	14.1	13.6	13.0	13.9	13.4	N N W	11.5	12.6	12.5	12.7	12.9	13.5	12.7	12.9	12.6	12.8	13.0	12.8								
	Min.	S S W	12.7	13.4	13.9	14.4	14.3	14.4	14.2	14.1	13.6	13.0	13.9	13.4	N N W	11.5	12.6	12.5	12.7	12.9	13.5	12.7	12.9	12.6	12.8	13.0	12.8	S S W	12.7	13.4	13.9	14.4	14.3	14.4	14.2	14.1	13.6	13.0	13.9	13.4	N N W	11.5	12.6	12.5	12.7	12.9	13.5	12.7	12.9	12.6	12.8	13.0	12.8								
100m	Max.	S S W	15.0	14.4	14.7	14.7	15.0	14.7	14.8	15.2	15.0	14.0	14.9	14.4	N N W	13.0	14.0	13.8	13.7	13.8	14.3	14.0	13.6	13.9	13.7	13.9	13.8	S S W	13.5	13.8	14.3	14.3	14.3	14.6	14.5	14.4	14.0	13.7	13.5	13.1	N N W	13.2	13.2	13.2	13.2	13.4	14.1	13.4	13.6	13.5	13.3	13.6	13.6								
	Min.	S S W	13.5	13.8	14.3	14.3	14.3	14.6	14.5	14.4	14.0	13.7	13.5	13.1	N N W	13.2	13.2	13.2	13.2	13.4	14.1	13.4	13.6	13.5	13.3	13.6	13.6	S S W	13.5	13.8	14.3	14.3	14.3	14.6	14.5	14.4	14.0	13.7	13.5	13.1	N N W	13.2	13.2	13.2	13.2	13.4	14.1	13.4	13.6	13.5	13.3	13.6	13.6								

Table Comparison of temperature change according to No. of lateral orifices in usable mine and distance from south to inside of mine.

No. of lateral orifices	Distance (m)	'88												'89																																															
		May												June												July												Aug.												Sept.											
		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.																								
0	3	11.9	12.6	13.6	14.5	14.6	14.0	12.7	11.5	9.6	7.9	8.7	11.6	12.6	12.7	13.5	13.9	13.6	13.4	13.1	12.3	12.6	12.0	11.5	12.7	13.6	13.5	13.5	13.9	14.1	13.9	13.8	13.4	13.4	13.0	12.9	13.5	14.1	14.9	14.9	15.0	14.9	15.2	15.0	14.9	15.0	15.0	15.0	15.0												
	50	12.6	12.7	13.5	13.9	13.6	13.4	13.1	12.3	12.6	12.0	11.5	12.7	13.6	13.5	13.5	13.9	14.1	13.9	13.8	13.4	13.4	13.0	12.9	13.5	14.1	14.9	14.9	15.0	14.9	15.2	15.0	14.9	15.0	15.0	15.0	15.0																								
	100	13.6	13.5	13.5	13.9	14.1	13.9	13.8	13.4	13.4	13.0	12.9	13.5	14.1	14.9	14.9	15.0	14.9	15.2	15.0	14.9	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0																								
	150	14.1	14.9	14.9	15.0	14.9	15.2	15.0	14.9	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0																									
2	3	9.9	10.9	12.4	12.7	12.5	12.6	9.4	7.6	5.4	4.3	4.9	8.5	9.8	10.4	11.6	12.0	11.9	12.2	8.7	5.2	3.0	4.2	5.0	8.1	10.6	11.0	12.1	12.6	12.6	12.5	9.8	5.2	5.6	4.4	6.8	8.8	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9												
	50	9.8	10.4	11.6	12.0	11.9	12.2	8.7	5.2	3.0	4.2	5.0	8.1	10.6	11.0	12.1	12.6	12.6	12.5	9.8	5.2	5.6	4.4	6.8	8.8	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9																								
	100	10.6	11.0	12.1	12.6	12.6	12.5	9.8	5.2	5.6	4.4	6.8	8.8	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9																								
150	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9	10.7	11.1	12.1	12.6	12.6	11.4	8.5	7.5	6.3	4.9	6.5	8.9																									

1) Distance from the south into inside of mine.

Table. Fluctuation of temperature and relative humidity in the usable mine and out side of mine

Classification	'88												'89												
	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	
Max. temp. mine (°C)	Unusable	13.7	13.5	13.3	13.4	13.5	13.8	14.0	13.5	13.7	13.6	13.6	13.5	13.7	13.5	13.3	13.4	13.5	13.8	14.0	13.5	13.7	13.6	13.6	13.5
	Outside	27.3	28.5	29.5	30.7	27.5	24.5	18.2	8.8	5.1	10.7	12.3	22.9	27.3	28.5	29.5	30.7	27.5	24.5	18.2	8.8	5.1	10.7	12.3	22.9
Min. temp. mine (°C)	Unusable	12.3	12.9	12.9	13.2	13.2	13.4	13.0	13.0	13.1	13.0	13.2	13.2	12.3	12.9	12.9	13.2	13.2	13.4	13.0	13.0	13.1	13.0	13.2	13.2
	Outside	13.0	15.7	20.2	19.3	14.5	10.5	0.7	0.4	0.8	3.6	1.2	3.1	13.0	15.7	20.2	19.3	14.5	10.5	0.7	0.4	0.8	3.6	1.2	3.1
R.H. (%)	Unusable	96.0	97.0	95.7	96.0	95.3	95.3	96.3	96.3	96.3	96.7	96.3	96.3	96.0	97.0	95.7	96.0	95.3	95.3	96.3	96.3	96.3	96.7	96.3	96.3
	Outside	86.5	64.7	81.3	87.3	88.3	83.0	85.0	86.0	70.7	81.7	64.3	78.0	86.5	64.7	81.3	87.3	88.3	83.0	85.0	86.0	70.7	81.7	64.3	78.0

1) R.H. : Relative humidity

Table. Comparison of the micro-climate according to the lateral orifices

No. of lateral orifices	Years	May						June						July						Aug.						Sept.																							
		M		L		E		M		L		E		M		L		E		M		L		E		M		L		E																			
		Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late	Early	Middle	Late																		
0	Av. temp.	'88	12.9	13.2	13.4	13.5	13.5	13.5	13.6	13.9	14.1	14.2	14.2	14.6	15.0	15.0	14.6	15.0	15.1	14.2	14.5	14.3	14.3	14.2	'89	13.8	13.8	14.1	14.1	14.1	14.1	14.2	14.2	14.6	15.0	15.0	14.6	15.0	15.1	14.2	14.5	14.3	14.3	14.2	14.5	14.3	14.3	14.2	
	R.H. (%)	'88	98	96	98	96	95	97	98	98	98	97	97	96	96	96	96	96	97	97	98	97	97	98	97	'89	97	96	96	96	96	98	96	96	96	96	96	97	97	96	97	97	98	97	97	98	97	97	98
2	Av. temp.	'88	10.3	10.0	10.4	11.1	11.1	11.1	11.5	12.2	12.5	12.3	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.3	12.5	12.5	12.5	12.3	'89	10.0	10.9	11.3	11.7	11.6	11.6	11.6	12.4	13.6	14.1	13.8	12.8	13.0											
	R.H. (%)	'88	98	97	95	97	96	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	97	'89	95	96	97	97	98	97	97	98	96	97	96	96	97											

\* E, M, L : Early, Middle and Late date of month

Table Utilization of artificial caves by farmer

Kinds of cave	Utilization	Benefit	Dimension	Temp. & humidity
Disused tunnel	Cultivation of mushroom "pleurotus ostreatus Kusser"	o Extension of cultivated duration for 1 - 2 months o Reduction of facility cost and energy input	Length: 1.7km Width: 4.5m Height: 4.5m	R.H.: 90%
Artificial cave	Storage of pickled shrimps	o Improving quality of the pickled	Length: 28-100m Width: 1.3-2.0m Height: 1.6-2.0m	R.H.: 90- Air temp 11.5-1

1) R.H. : Relative Humidity

Table. Occurring rate of lateral bud, rotten rate and reduction of weight in Irish potato and sweet potato according to treatment

Crops	Treatments	Usable mine (%)			Simple storage facility (%)		
		Lateral bud occurrence	rotten rate	Weight reduction	Lateral bud occurrence	rotten rate	Weight reduction
Irish Potato	T C N B	100.0	0	6.1	95.0	8.1	24.6
	Sulfuric acid	9.3	2.7	5.0	96.9	13.2	21.5
	A B A	21.5	14.8	16.2	78.3	21.7	32.2
	Control	25.2	0	2.9	95.4	4.6	18.7
Sweet Potato	T C N B	0	0	7.9	55.0	0.7	15.3
	Sulfuric acid	0	0	11.6	47.4	1.4	22.3
	A B A	0	0	6.0	50.2	0	18.5