

SUPPLEMENTARY MATERIALS

1. Experimental design matrix and measured responses

Table 1 present the experimental design matrix and measured responses the complete experimental design matrix and all measured responses, including water absorption rate, tensile strength, elongation at break, Young's modulus, hemicellulose content, cellulose content, lignin content, fineness, moisture regain, and density.

Table S1. Experimental design matrix and measured responses

N o.	T (° C)	NaOH (%)	Time (min)	Water Absorption (%)	Moisture Regain (%)	Fineness (Tex)	Density (g/m ³)	Young's Modulus (MPa)	Tensile Strength (MPa)	Elongation (%)	Lignin (%)	Hemicellulose (%)	Cellulose (%)
1	100	1	30	151.83	10.43	26.58	0.425	2545.0	82.10	0.0384	20.77	7.10	72.13
2	100	1	60	156.28	10.87	30.78	0.410	4188.2	90.40	0.0293	19.22	6.20	74.57
3	100	3	30	171.19	10.01	41.75	0.403	3513.2	82.90	0.0309	28.19	5.38	66.41
4	100	3	60	155.76	9.49	39.75	0.421	3670.0	86.01	0.0329	24.18	4.08	71.73
5	50	1	30	171.20	17.10	38.94	0.442	5145.1	82.60	0.0262	29.09	9.47	61.43
6	50	1	60	140.46	10.71	37.97	0.470	5412.4	96.30	0.0264	20.15	11.80	68.04
7	50	3	30	148.30	10.88	40.54	0.406	4342.4	103.60	0.0281	20.78	9.31	69.90
8	50	3	60	170.53	10.62	40.14	0.374	5840.0	122.40	0.0286	21.93	9.32	68.73

2. General Alias Structure of the Factorial Design

Factor	Description
A	Temperature
B	NaOH concentration
C	Treatment duration

Aliases

- I: Intercept
- A: Temperature
- B: NaOH concentration
- C: Treatment duration
- AB: Temperature × NaOH concentration
- AC: Temperature × Treatment duration
- BC: NaOH concentration × Treatment duration
- ABC: Temperature × NaOH concentration × Treatment duration

3. Water absorption rate (WA%)

This section presents the complete statistical analyses and graphical representations related to the water absorption rate of the treated fibers.

Tables

- **Table S2. Factorial regression coefficients of water absorption rate**

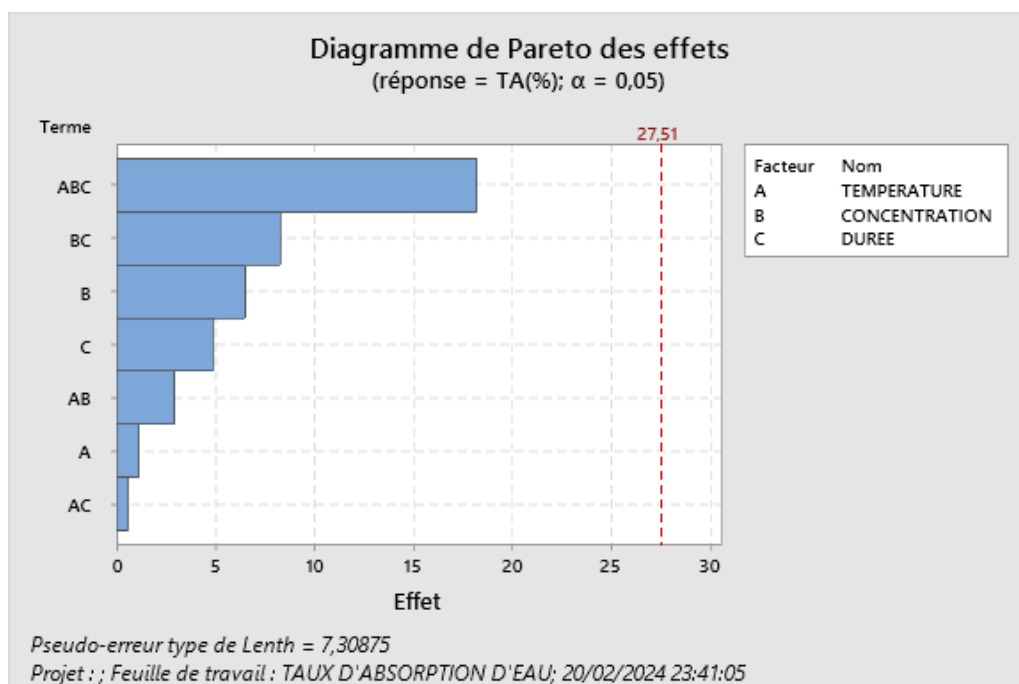
TERM	EFFECT	COEF	SE COEF	T- VALUE	P- VALUE	VIF
Constant		158.2	*	*	*	
TEMPERATURE	1.1425	0.5712	*	*	*	1.00
CONCENTRATION	6.502	3.251	*	*	*	1.00
DURATION	-4.873	-2.436	*	*	*	1.00
TEMPERATURE*CONCENTRATION	2.917	1.459	*	*	*	1.00
TEMPERATURE*DURATION	-0.6175	-	*	*	*	1.00
		0.3088				
CONCENTRATION*DURATION	8.272	4.136	*	*	*	1.00
TEMPERATURECONCENTRATIONDURATION	-18.212	-9.106	*	*	*	1.00

- **Table S3. Analysis of variance (ANOVA) of water absorption rate**

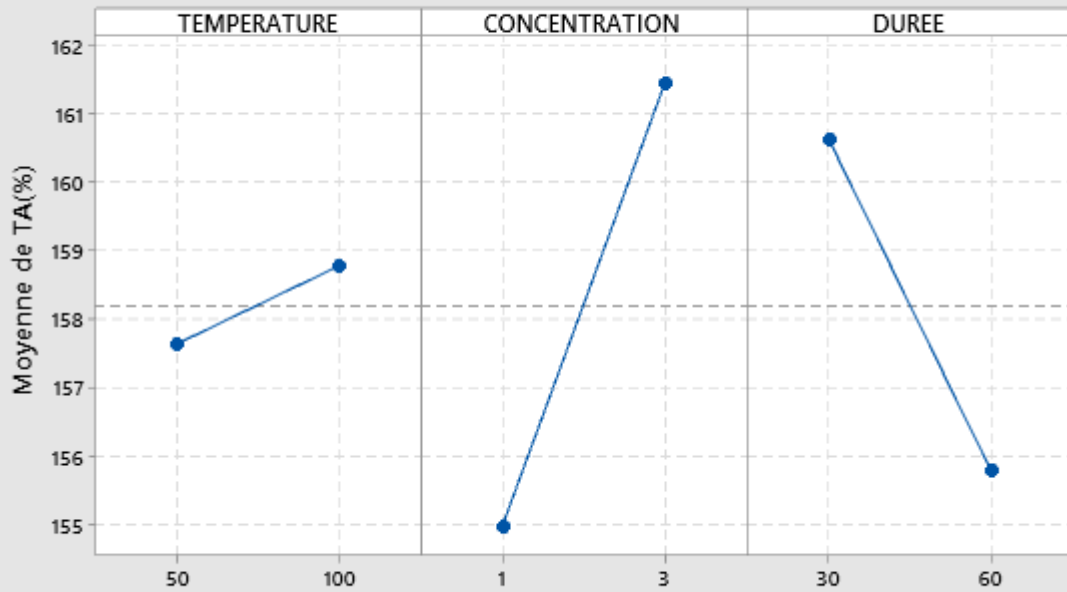
Source	DF	Adj SS	Adj MS	F-Value	p-Value
Model	7	952.703	136.100	*	*
Linear	3	134.658	44.886	*	*
TEMPERATURE	1	2.611	2.611	*	*
CONCENTRATION	1	84.565	84.565	*	*
DURATION	1	47.483	47.483	*	*
2-Way Interactions	3	154.655	51.552	*	*
TEMPERATURE*CONCENTRATION	1	17.024	17.024	*	*
TEMPERATURE*DURATION	1	0.763	0.763	*	*
CONCENTRATION*DURATION	1	136.869	136.869	*	*
3-Way Interactions	1	663.390	663.390	*	*
TEMPERATURECONCENTRATIONDURATION	1	663.390	663.390	*	*
Error	0	*	*		
Total	7	952.703			

Figures

- **Figure S1. Factorial plot of water absorption rate**

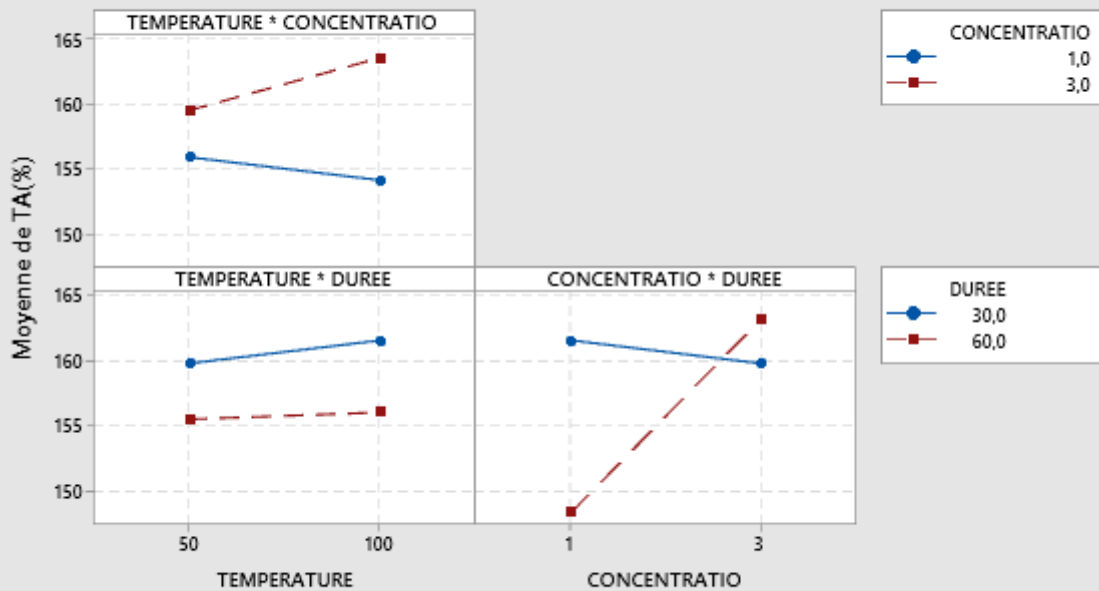


Graphique des effets principaux pour TA(%) Moyennes ajustées



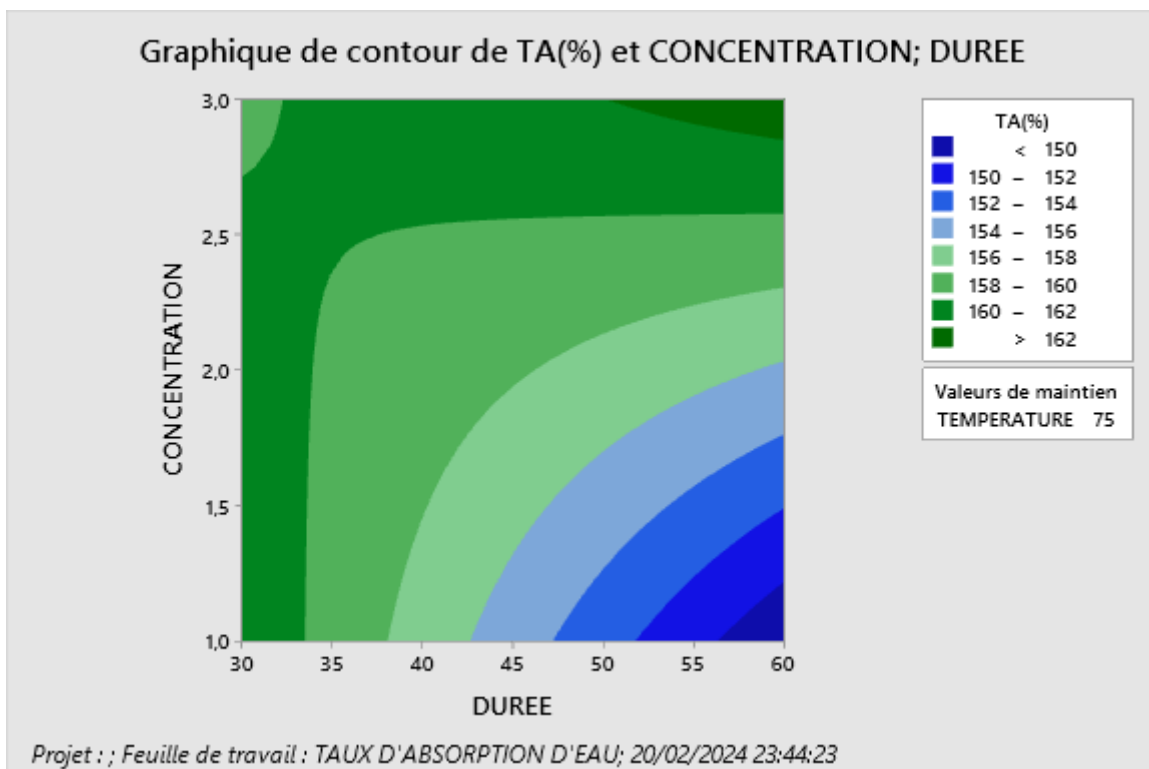
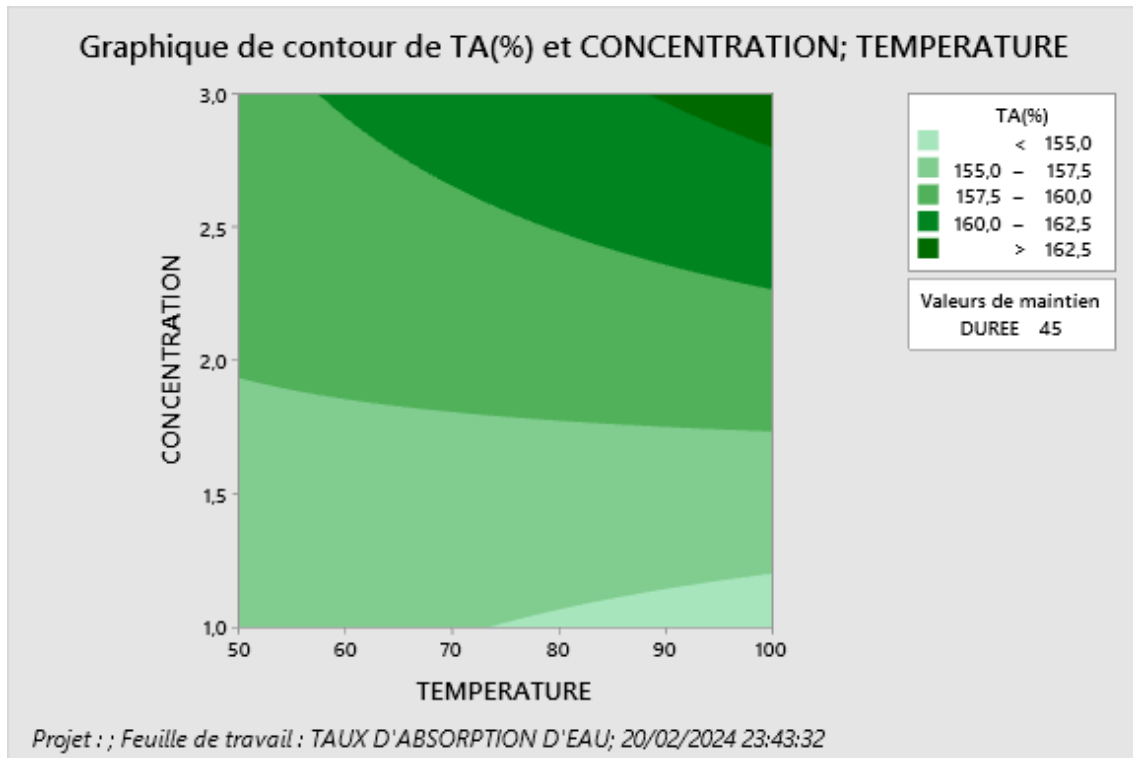
Projet : ; Feuille de travail : TAUX D'ABSORPTION D'EAU; 20/02/2024 23:43:10

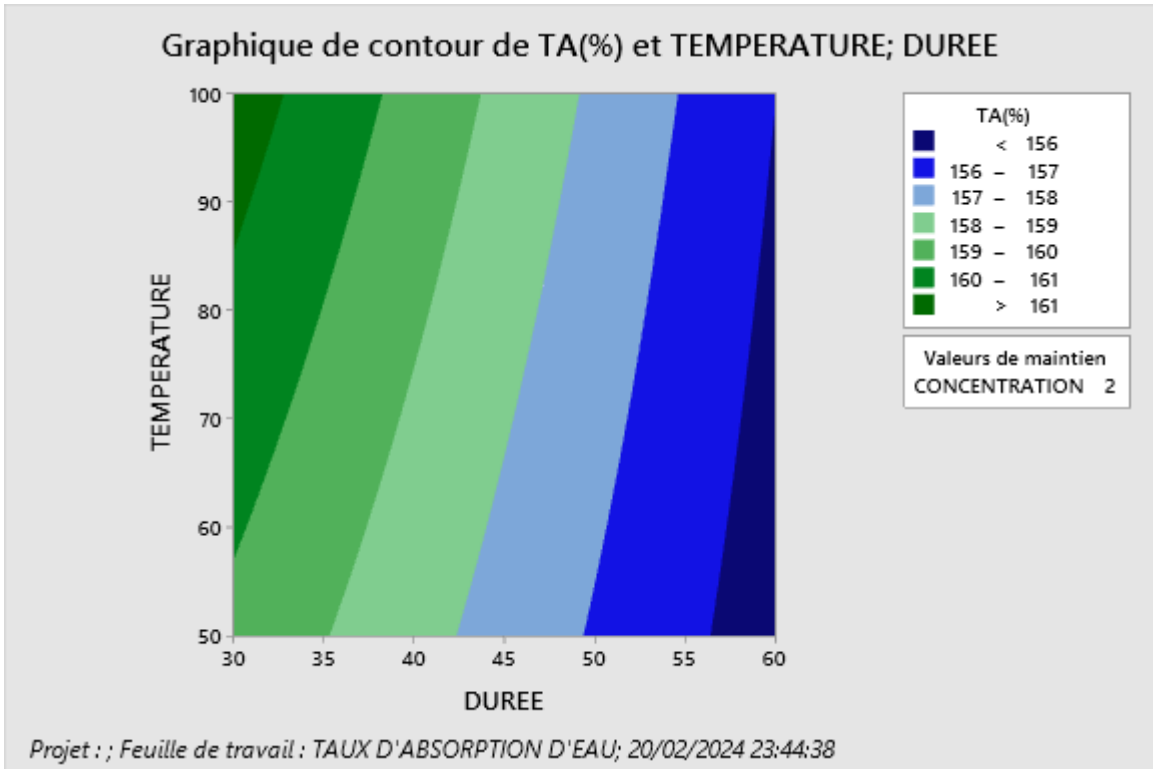
Diagramme des interactions pour TA(%) Moyennes ajustées



Projet : ; Feuille de travail : TAUX D'ABSORPTION D'EAU; 20/02/2024 23:43:10

- **Figure S2. Contour plot of water absorption rate**





- **Figure S3. Response surface plot of water absorption rate**

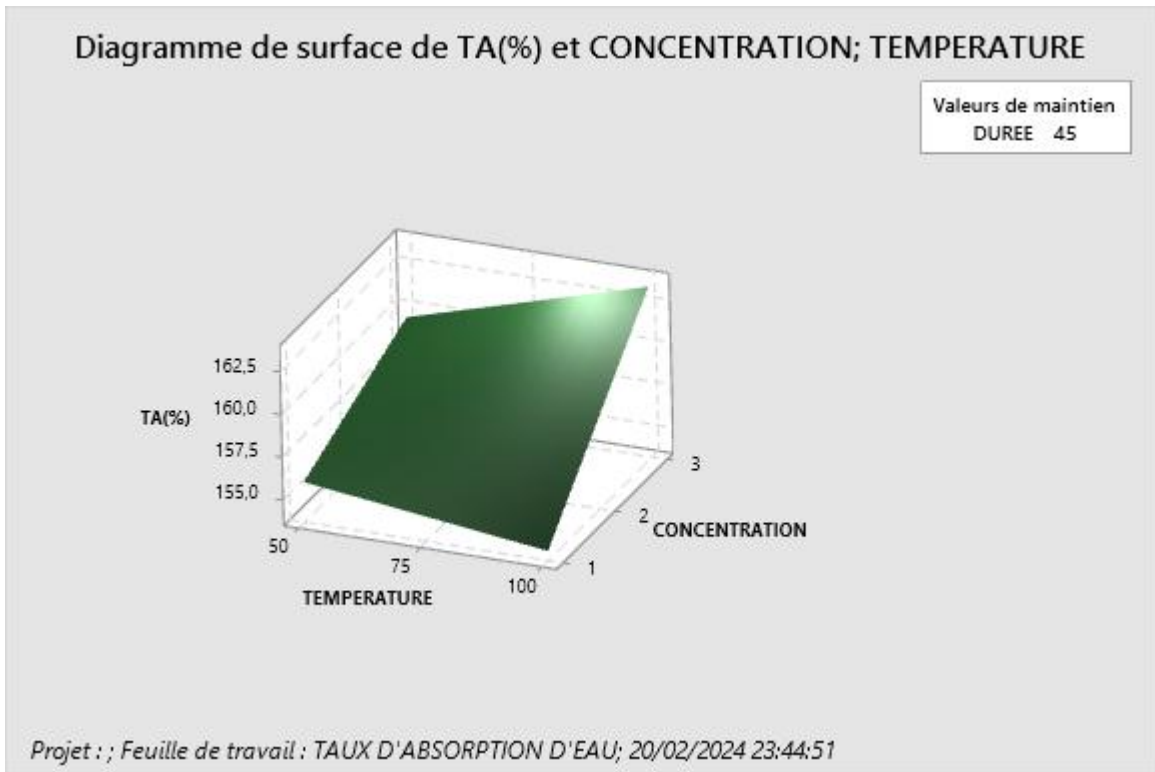
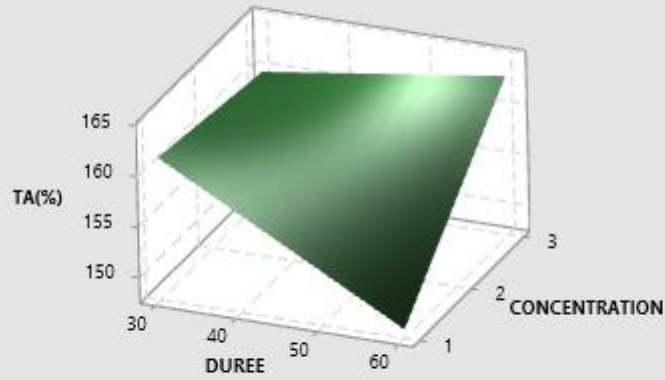


Diagramme de surface de TA(%) et CONCENTRATION; DUREE

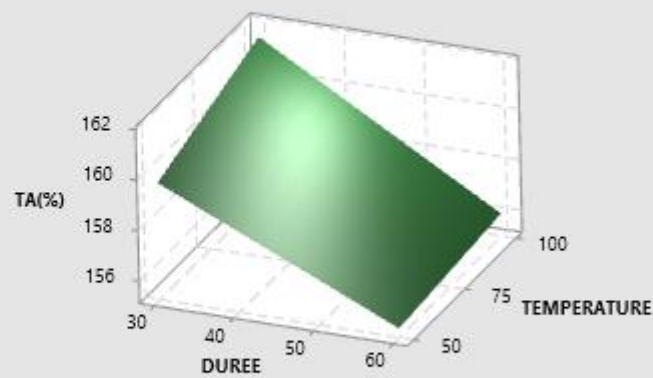
Valeurs de maintien
TEMPERATURE 75



Projet : ; Feuille de travail : TAUX D'ABSORPTION D'EAU; 20/02/2024 23:45:12

Diagramme de surface de TA(%) et TEMPERATURE; DUREE

Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : TAUX D'ABSORPTION D'EAU; 20/02/2024 23:45:30

4. Moisture regain

This section presents the statistical analyses and graphical representations related to the moisture regain of the treated fibers.

Tables

- Table S4. Factorial regression coefficients of moisture regain

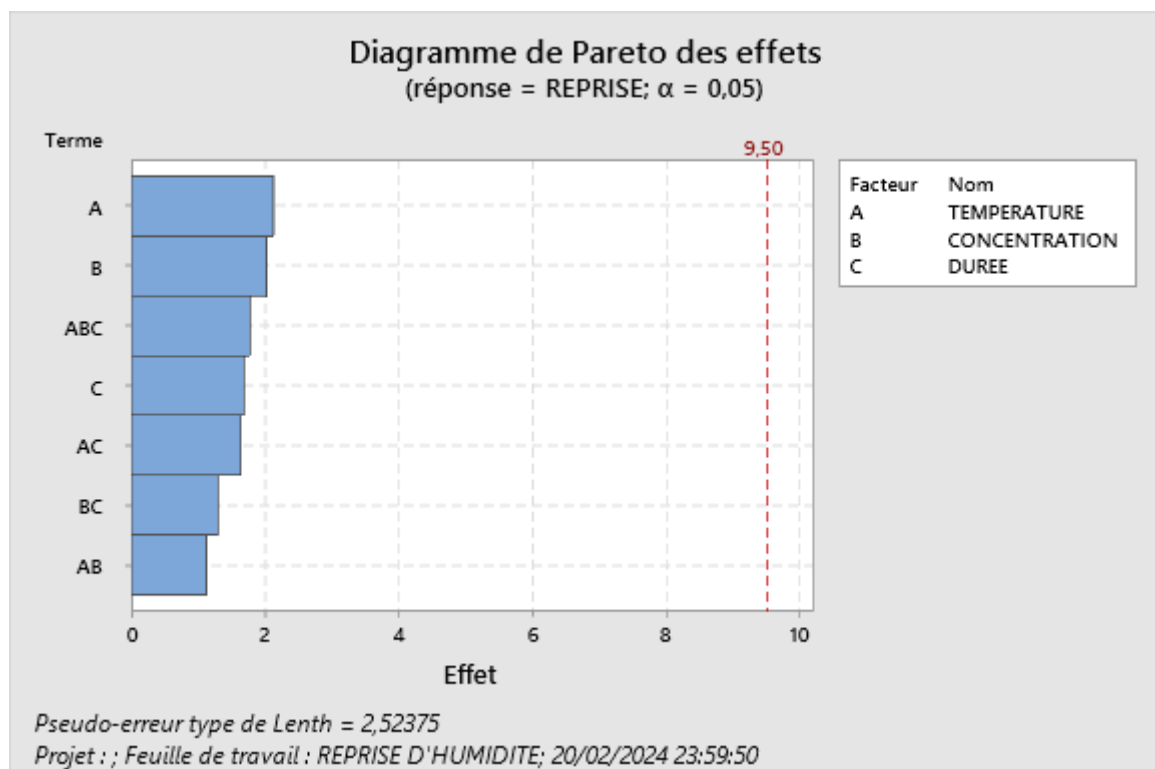
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		11.26	*	*	*	
TEMPERATURE	-2.128	-1.064	*	*	*	1.00
CONCENTRATION	-2.027	-1.014	*	*	*	1.00
TIME	-1.6825	-0.8413	*	*	*	1.00
TEMPERATURE*CONCENTRATION	1.1275	0.5638	*	*	*	1.00
TEMPERATURE*TIME	1.6425	0.8213	*	*	*	1.00
CONCENTRATION*TIME	1.2925	0.6462	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	-1.7725	-0.8862	*	*	*	1.00

- Table S5. Analysis of variance (ANOVA) of moisture regain

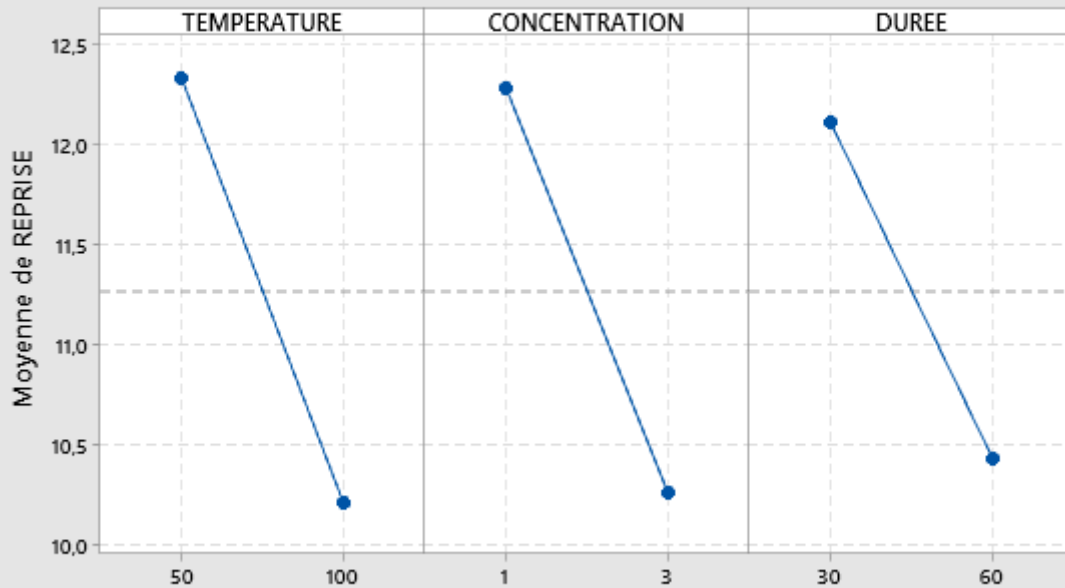
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	40.498	5.785	*	*
Linear	3	22.936	7.645	*	*
TEMPERATURE	1	9.053	9.053	*	*
CONCENTRATION	1	8.222	8.222	*	*
TIME	1	5.662	5.662	*	*
2-Way Interactions	3	11.279	3.760	*	*
TEMPERATURE*CONCENTRATION	1	2.543	2.543	*	*
TEMPERATURE*TIME	1	5.396	5.396	*	*
CONCENTRATION*TIME	1	3.341	3.341	*	*
3-Way Interactions	1	6.284	6.284	*	*
TEMPERATURE*CONCENTRATION*TIME	1	6.284	6.284	*	*
Error	0	*	*		
Total	7	40.498			

Figures

- Figure S4. Factorial plot of moisture regain

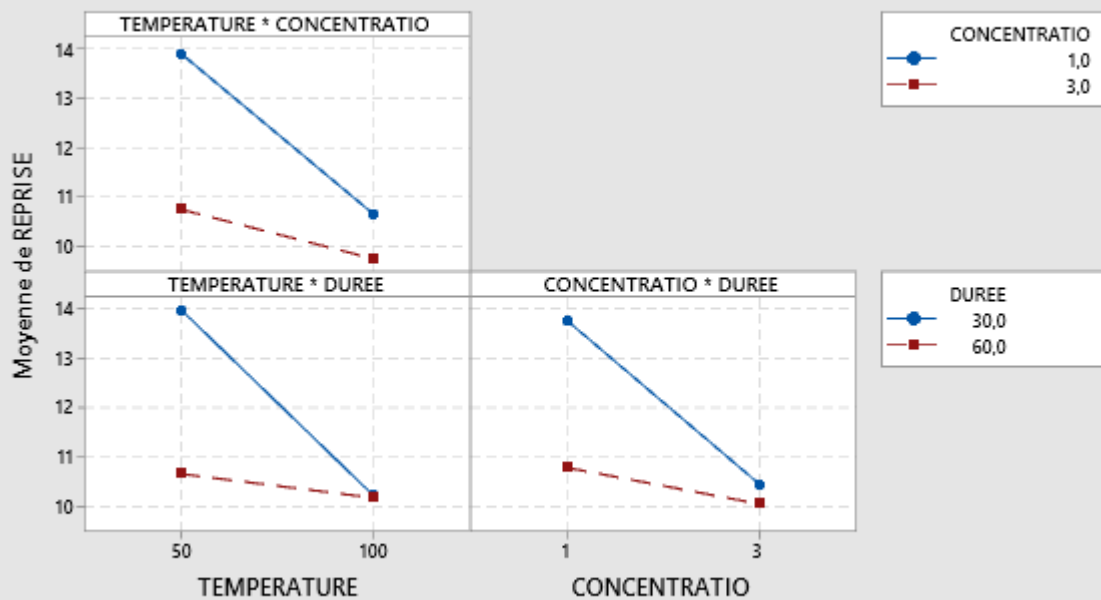


Graphique des effets principaux pour REPRISE Moyennes ajustées



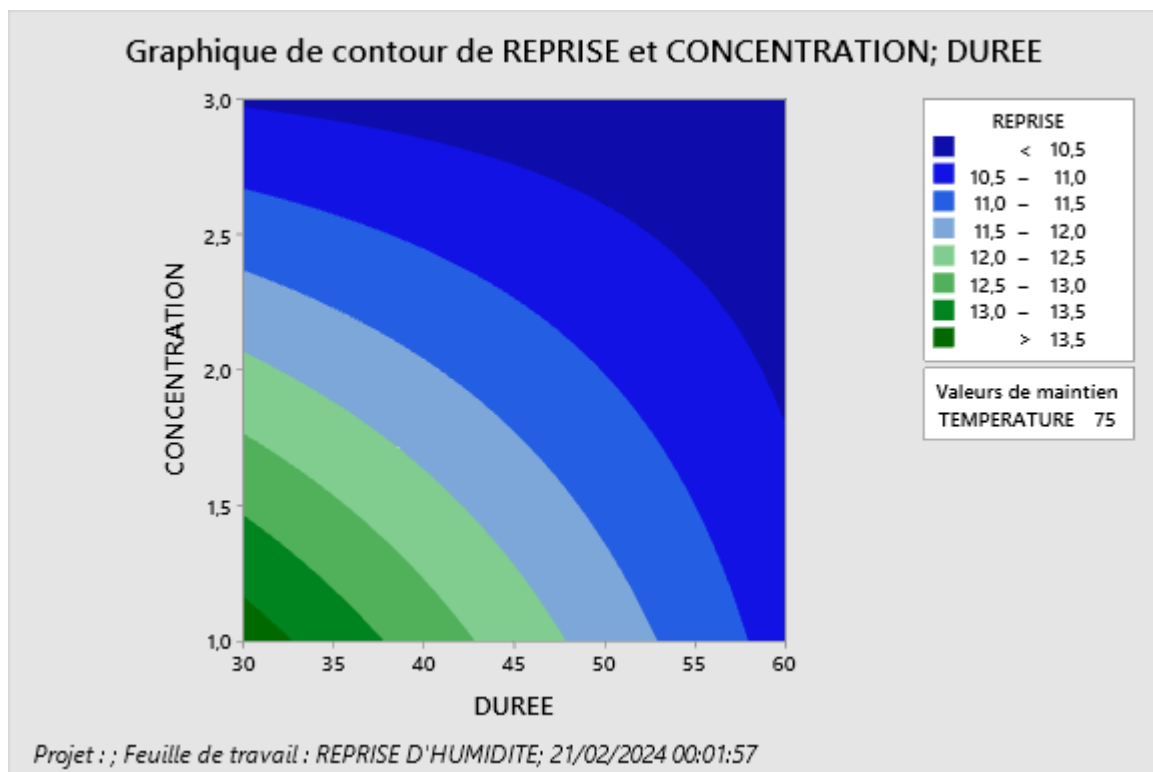
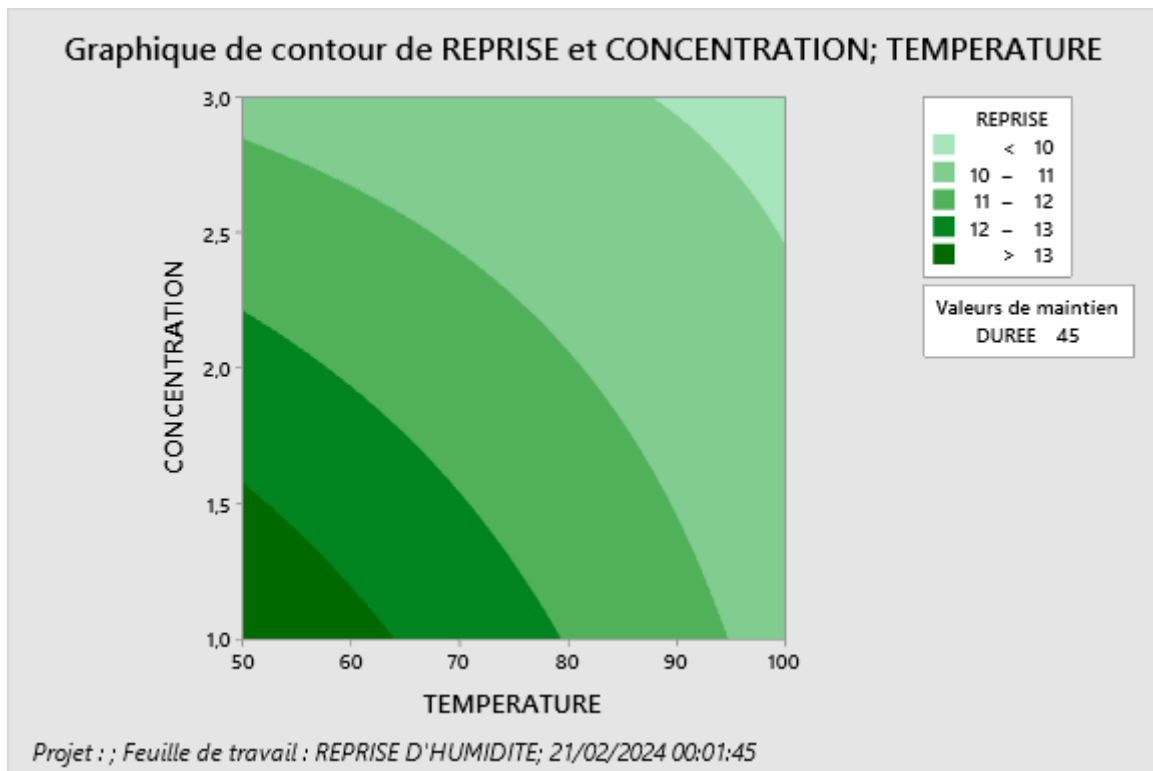
Projet ; ; Feuille de travail : REPRISE D'HUMIDITE; 21/02/2024 00:00:17

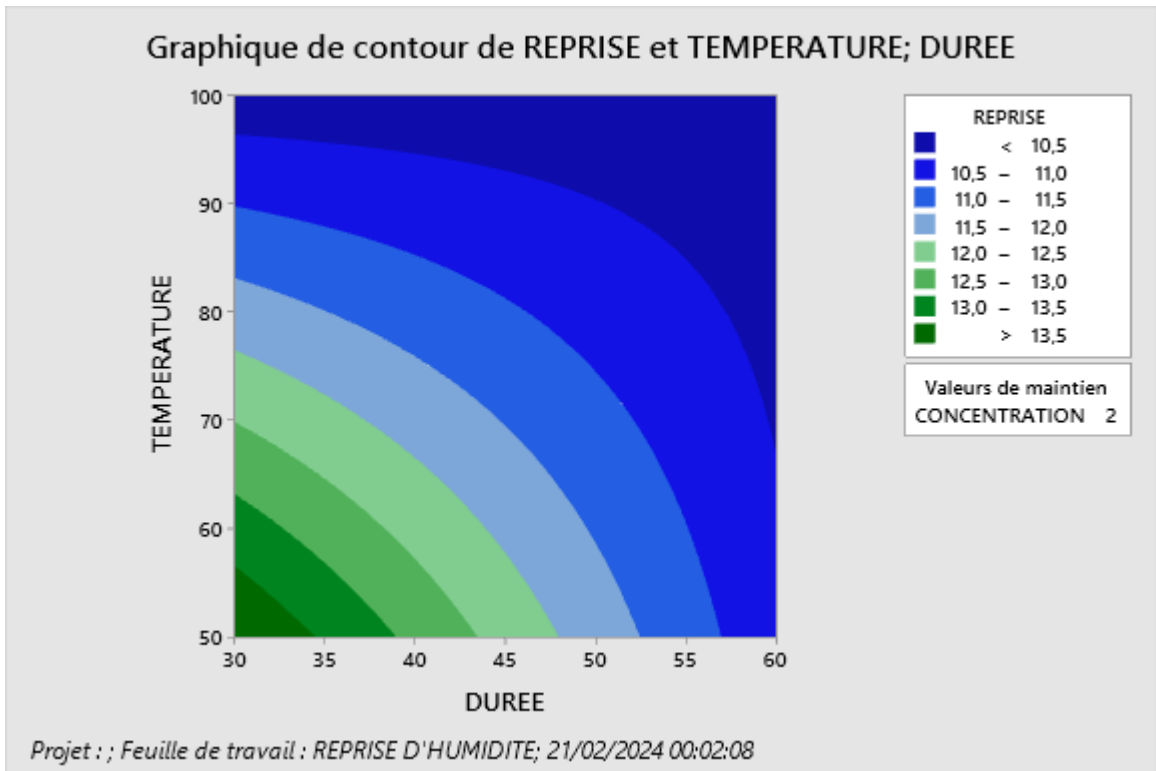
Diagramme des interactions pour REPRISE Moyennes ajustées



Projet ; ; Feuille de travail : REPRISE D'HUMIDITE; 21/02/2024 00:00:17

- **Figure S5. Contour plot of moisture regain**





- **Figure S6. Response surface plot of moisture regain**

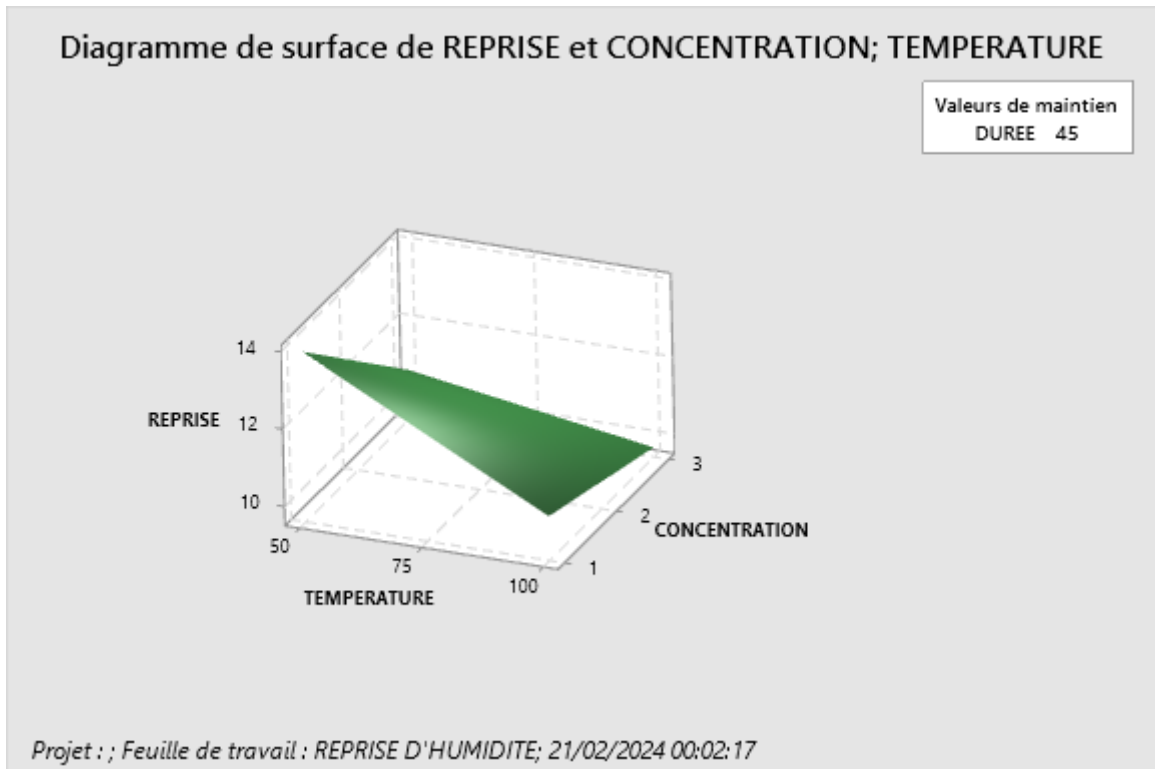
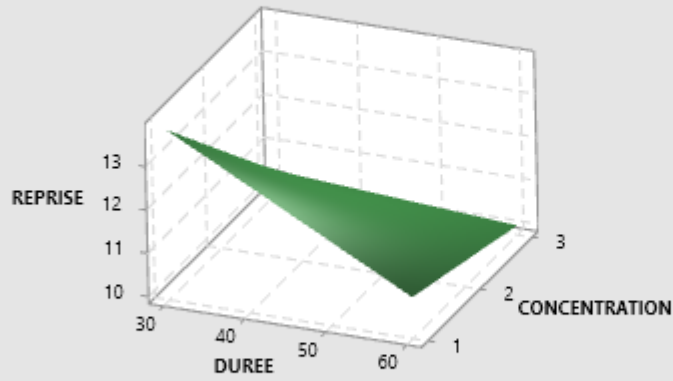


Diagramme de surface de REPRISE et CONCENTRATION; DUREE

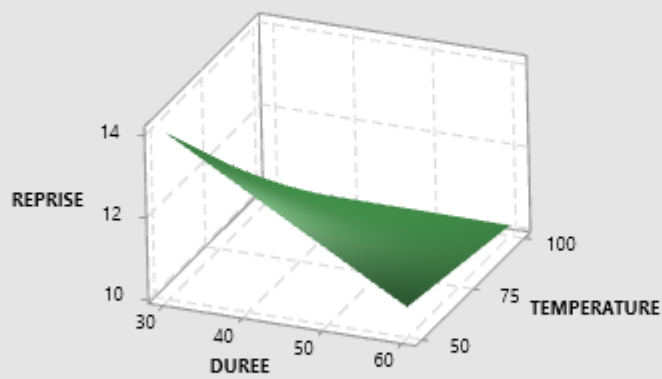
Valeurs de maintien
TEMPERATURE 75



Projet : ; Feuille de travail : REPRISE D'HUMIDITE; 21/02/2024 00:02:26

Diagramme de surface de REPRISE et TEMPERATURE; DUREE

Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : REPRISE D'HUMIDITE; 21/02/2024 00:02:35

5. Fineness

This section presents the statistical analyses and graphical representations associated with the fineness of the treated fibers.

Tables

- **Table S6. Factorial regression coefficients of fineness**

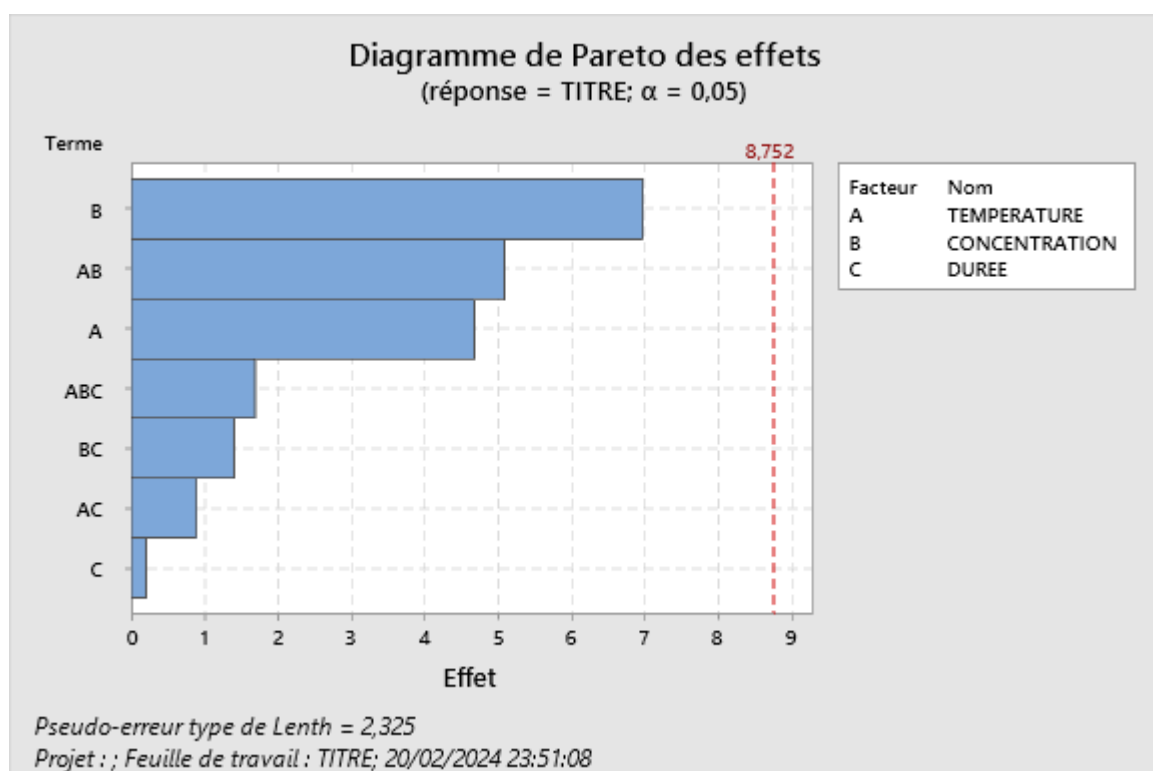
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		37.06	*	*	*	
TEMPERATURE	-4.683	-2.341	*	*	*	1.00
CONCENTRATION	6.977	3.489	*	*	*	1.00
TIME	0.2075	0.1038	*	*	*	1.00
TEMPERATURE*CONCENTRATION	5.092	2.546	*	*	*	1.00
TEMPERATURE*TIME	0.8925	0.4462	*	*	*	1.00
CONCENTRATION*TIME	-1.4075	-0.7038	*	*	*	1.00
TEMPERATURE*CONCENTRATION*TIME	-1.6925	-0.8462	*	*	*	1.00

- **Table S7. Analysis of variance (ANOVA) of fineness**

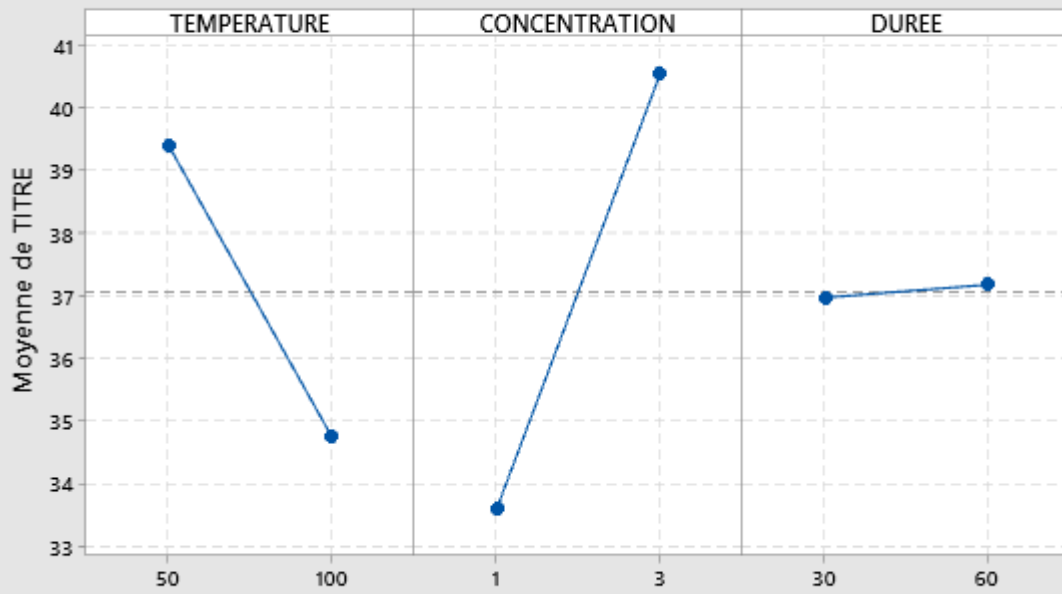
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	204.460	29.2086	*	*
Linear	3	141.309	47.1029	*	*
TEMPERATURE	1	43.852	43.8516	*	*
CONCENTRATION	1	97.371	97.3710	*	*
TIME	1	0.086	0.0861	*	*
2-Way Interactions	3	57.422	19.1408	*	*
TEMPERATURE*CONCENTRATION	1	51.867	51.8671	*	*
TEMPERATURE*TIME	1	1.593	1.5931	*	*
CONCENTRATION*TIME	1	3.962	3.9621	*	*
3-Way Interactions	1	5.729	5.7291	*	*
TEMPERATURECONCENTRATIONTIME	1	5.729	5.7291	*	*
Error	0	*	*		
Total	7	204.460			

Figures

- **Figure S7. Factorial plot of fineness**

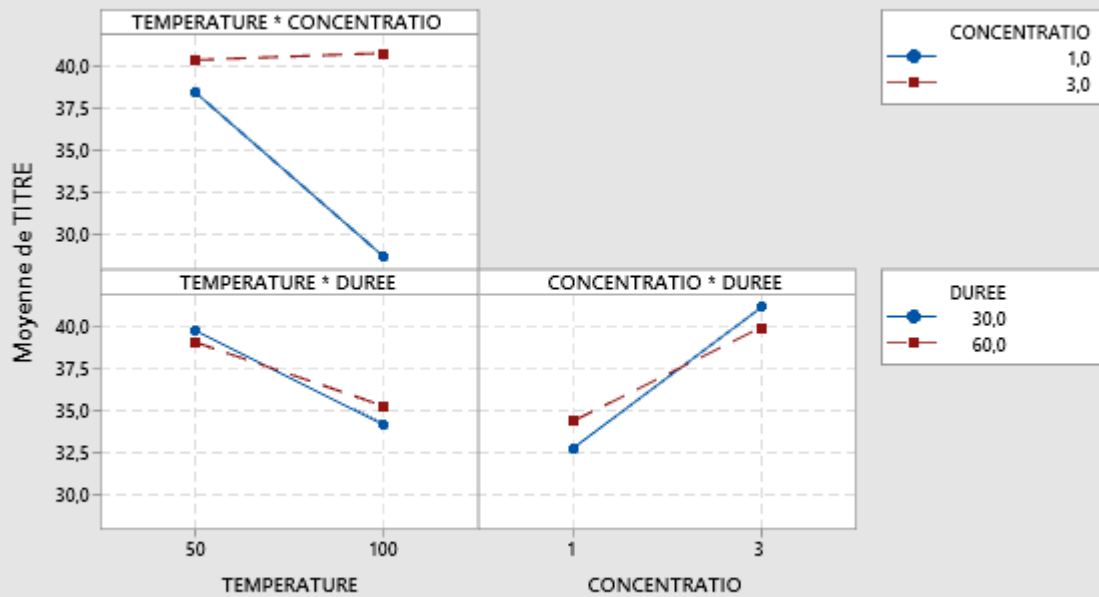


Graphique des effets principaux pour TITRE Moyennes ajustées



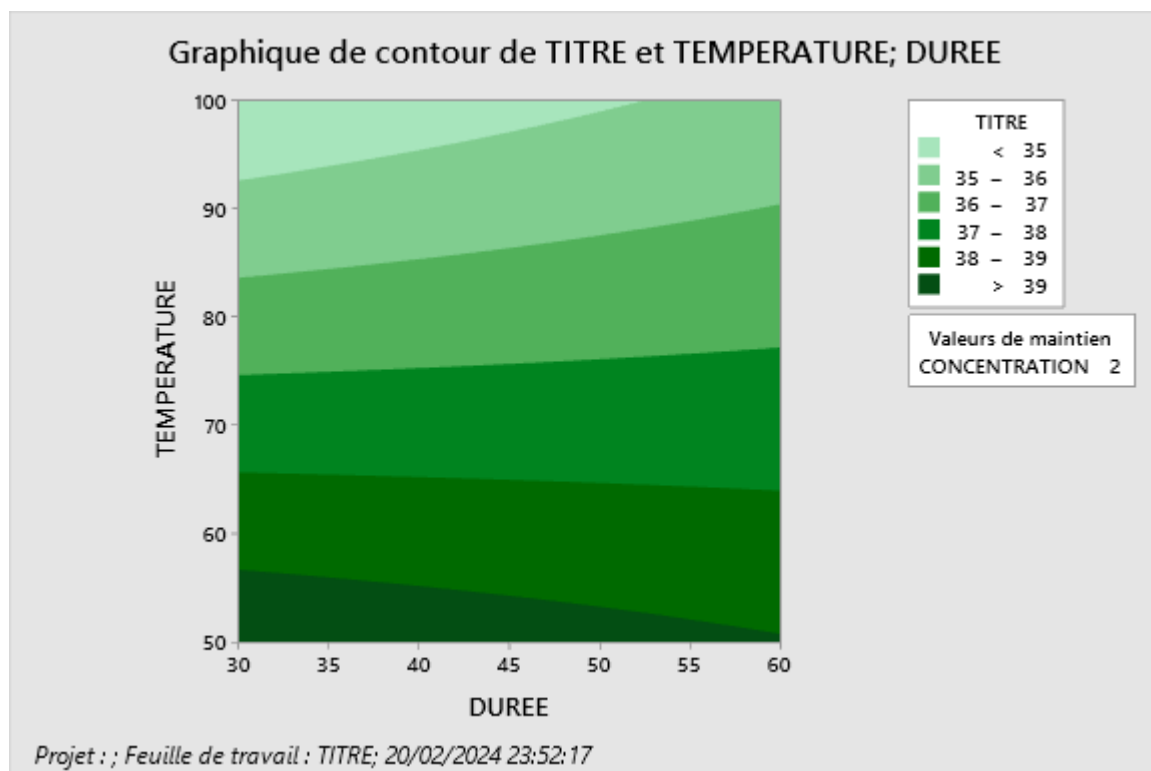
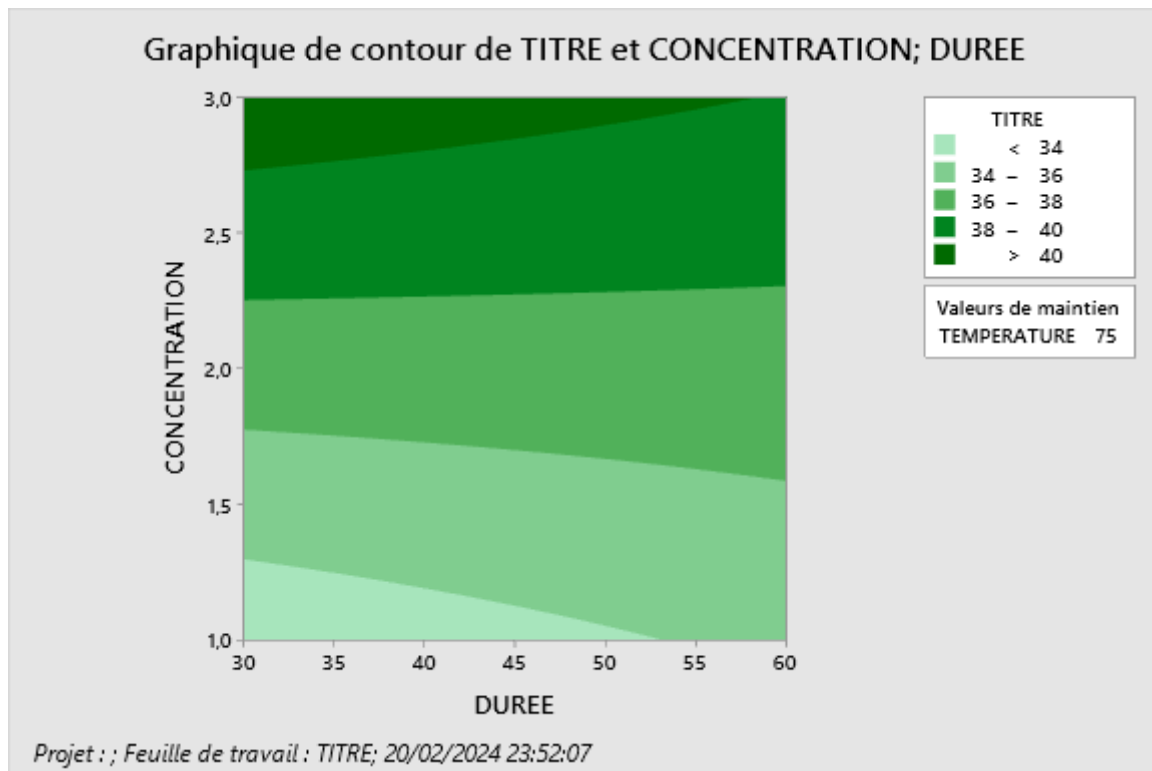
Projet : ; Feuille de travail : TITRE; 20/02/2024 23:51:39

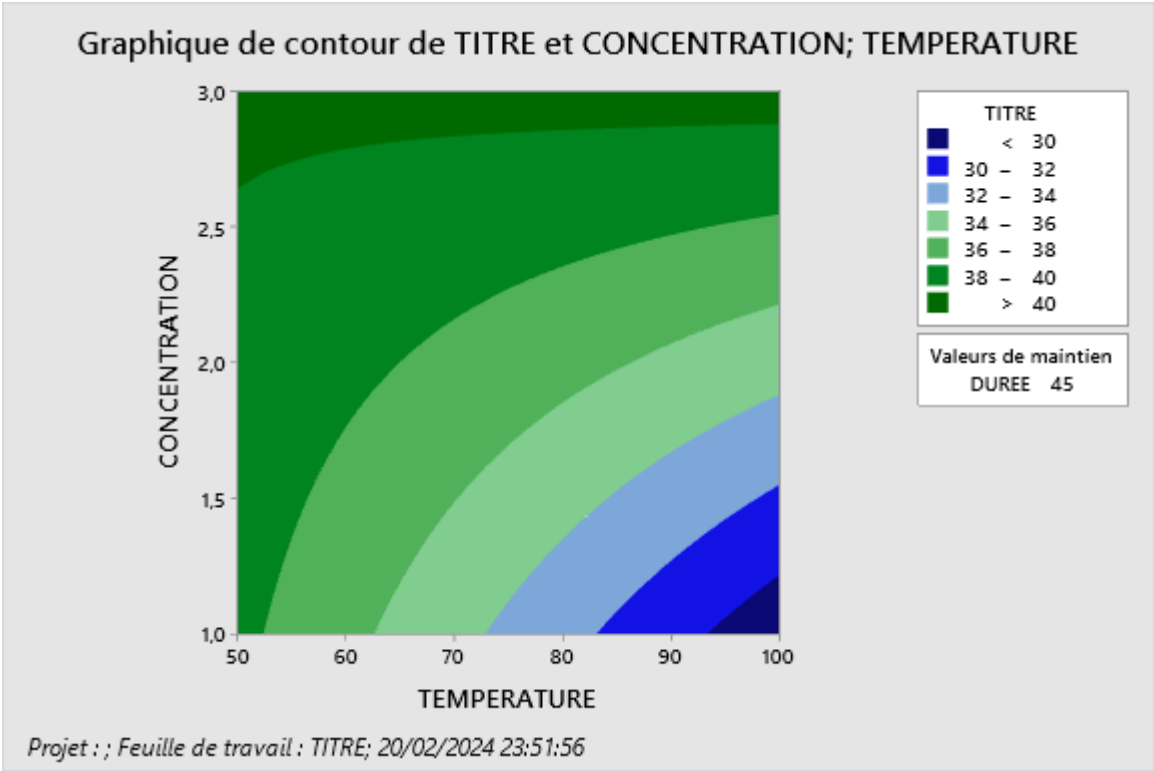
Diagramme des interactions pour TITRE Moyennes ajustées



Projet : ; Feuille de travail : TITRE; 20/02/2024 23:51:39

- **Figure S8. Contour plot of fineness**





- **Figure S9. Response surface plot of fineness**

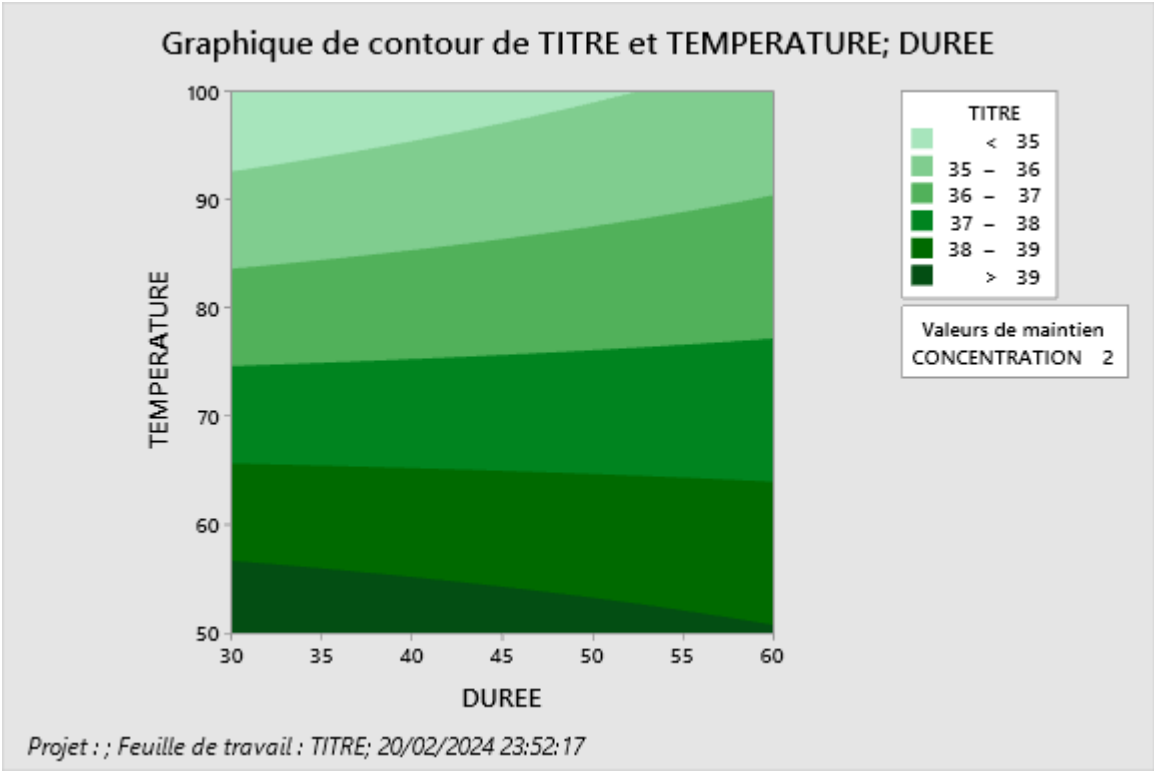
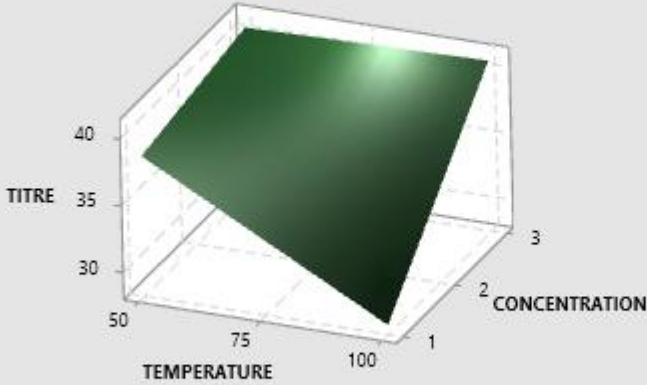


Diagramme de surface de TITRE et CONCENTRATION; TEMPERATURE

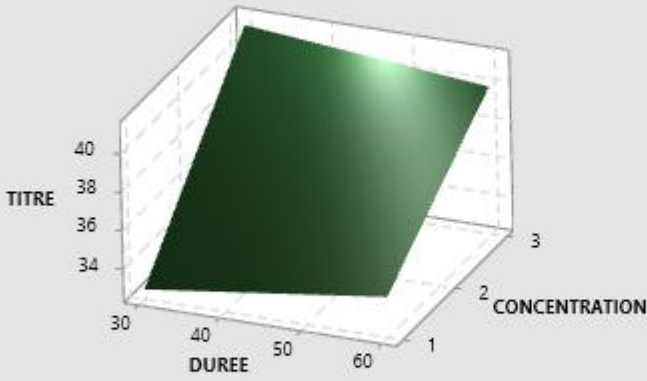
Valeurs de maintien
DUREE 45



Projet : ; Feuille de travail : TITRE; 20/02/2024 23:52:27

Diagramme de surface de TITRE et CONCENTRATION; DUREE

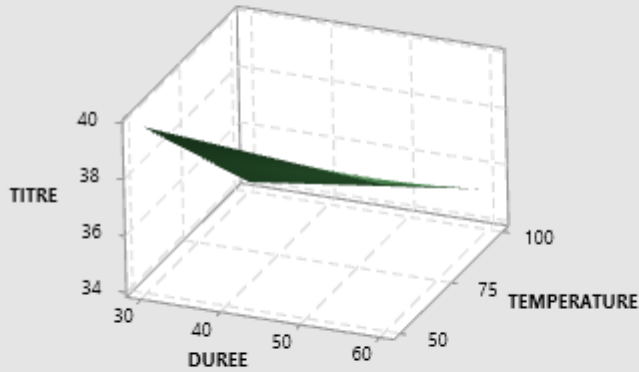
Valeurs de maintien
TEMPERATURE 75



Projet : ; Feuille de travail : TITRE; 20/02/2024 23:52:37

Diagramme de surface de TITRE et TEMPERATURE; DUREE

Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : TITRE; 20/02/2024 23:52:45

6. Density

This section presents the statistical analyses and graphical representations related to the density of the treated fibers.

Tables

- **Table S8. Factorial regression coefficients of density**

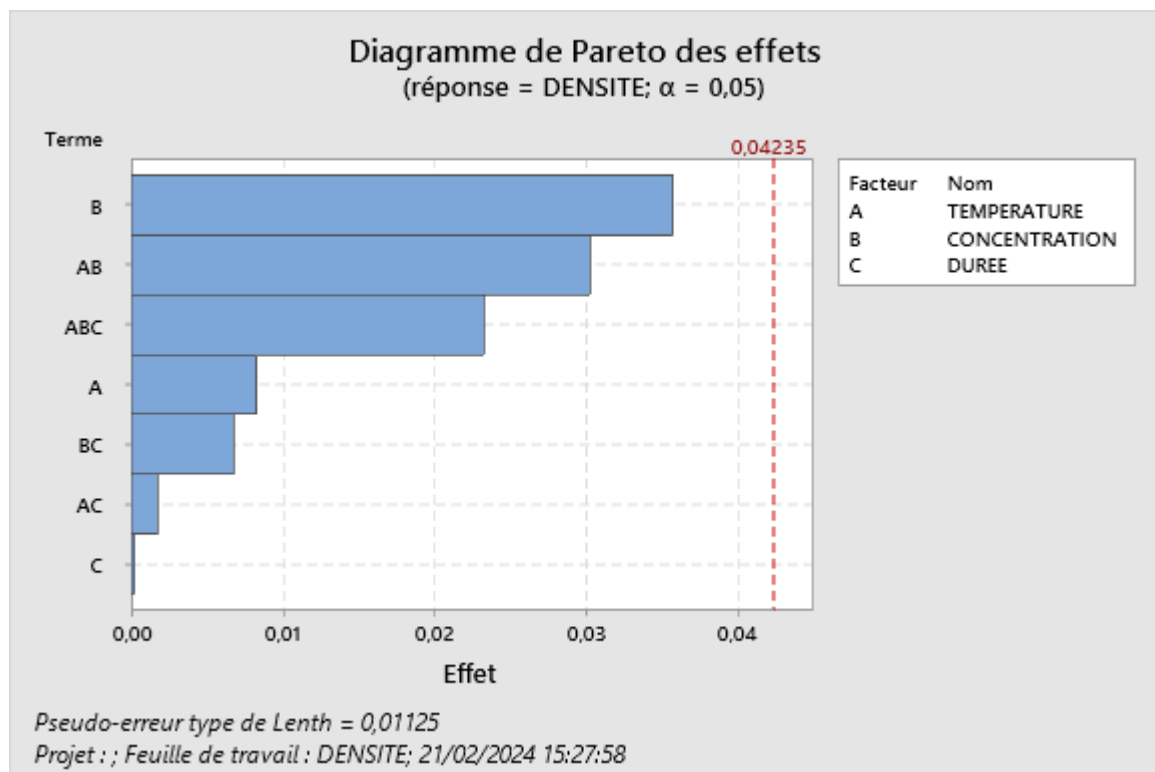
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		0.4189	*	*	*	
TEMPERATURE	-0.008250	-0.004125	*	*	*	1.00
CONCENTRATION	-0.03575	-0.01787	*	*	*	1.00
TIME	-0.000250	-0.000125	*	*	*	1.00
TEMPERATURE*CONCENTRATION	0.03025	0.01512	*	*	*	1.00
TEMPERATURE*TIME	0.001750	0.000875	*	*	*	1.00
CONCENTRATION*TIME	-0.006750	-0.003375	*	*	*	1.00
TEMPERATURE*CONCENTRATION*TIME	0.02325	0.01162	*	*	*	1.00

- **Table S9. Analysis of variance (ANOVA) of density**

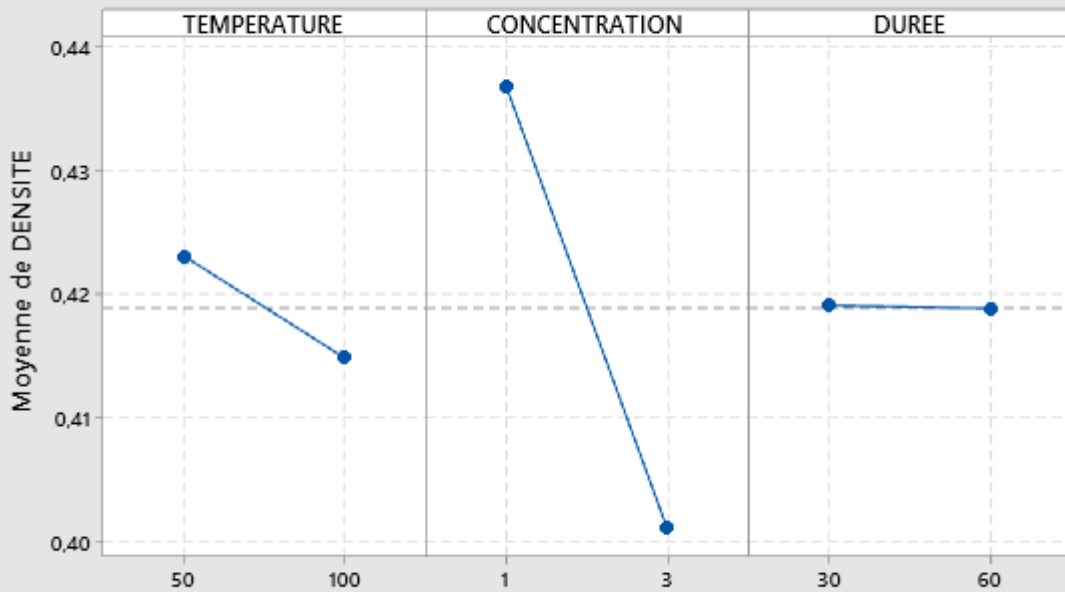
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	0.005701	0.000814	*	*
Linear	3	0.002692	0.000897	*	*
TEMPERATURE	1	0.000136	0.000136	*	*
CONCENTRATION	1	0.002556	0.002556	*	*
TIME	1	0.000000	0.000000	*	*
2-Way Interactions	3	0.001927	0.000642	*	*
TEMPERATURE*CONCENTRATION	1	0.001830	0.001830	*	*
TEMPERATURE*TIME	1	0.000006	0.000006	*	*
CONCENTRATION*TIME	1	0.000091	0.000091	*	*
3-Way Interactions	1	0.001081	0.001081	*	*
TEMPERATURECONCENTRATIONTIME	1	0.001081	0.001081	*	*
Error	0	*	*		
Total	7	0.005701			

Figures

- **Figure S10. Factorial plot of density**

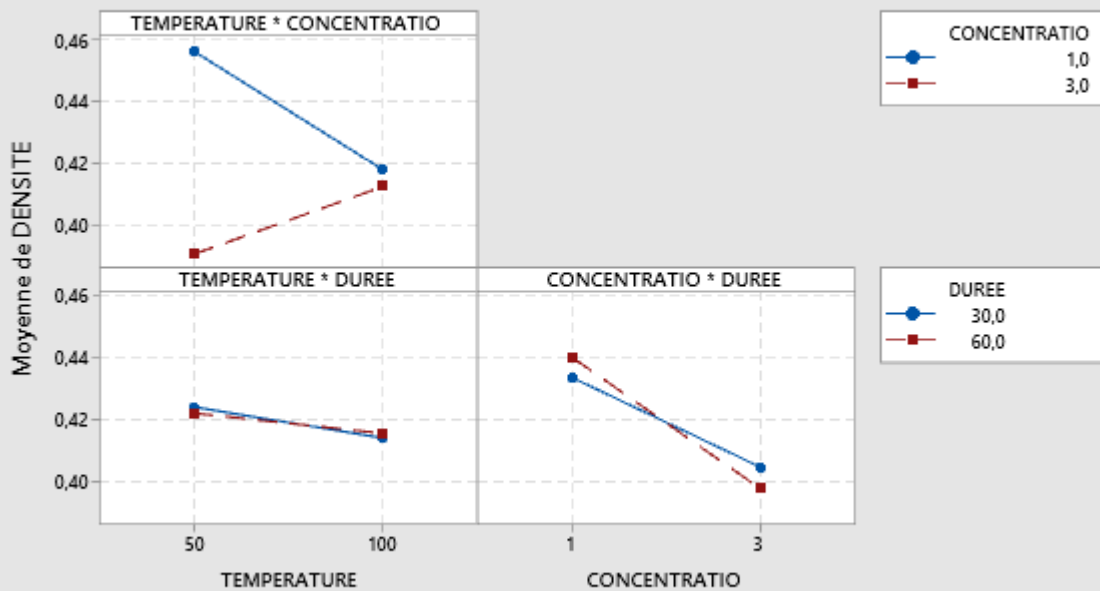


Graphique des effets principaux pour DENSITE Moyennes ajustées



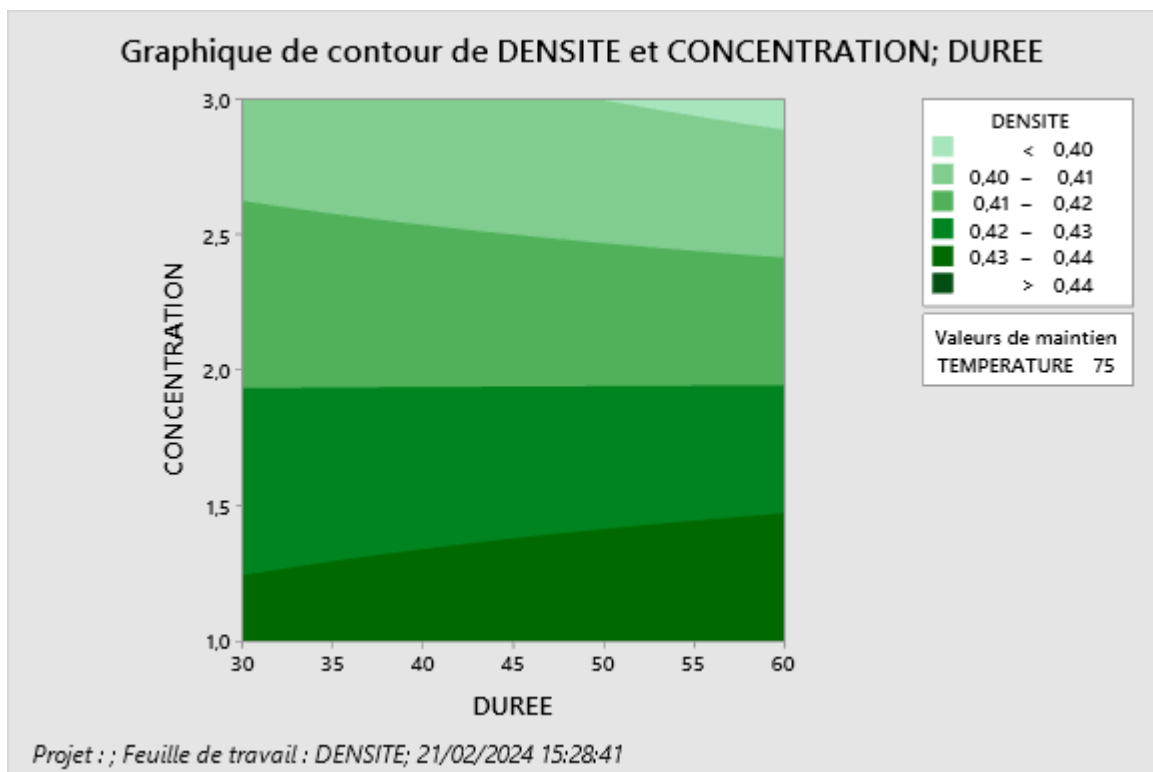
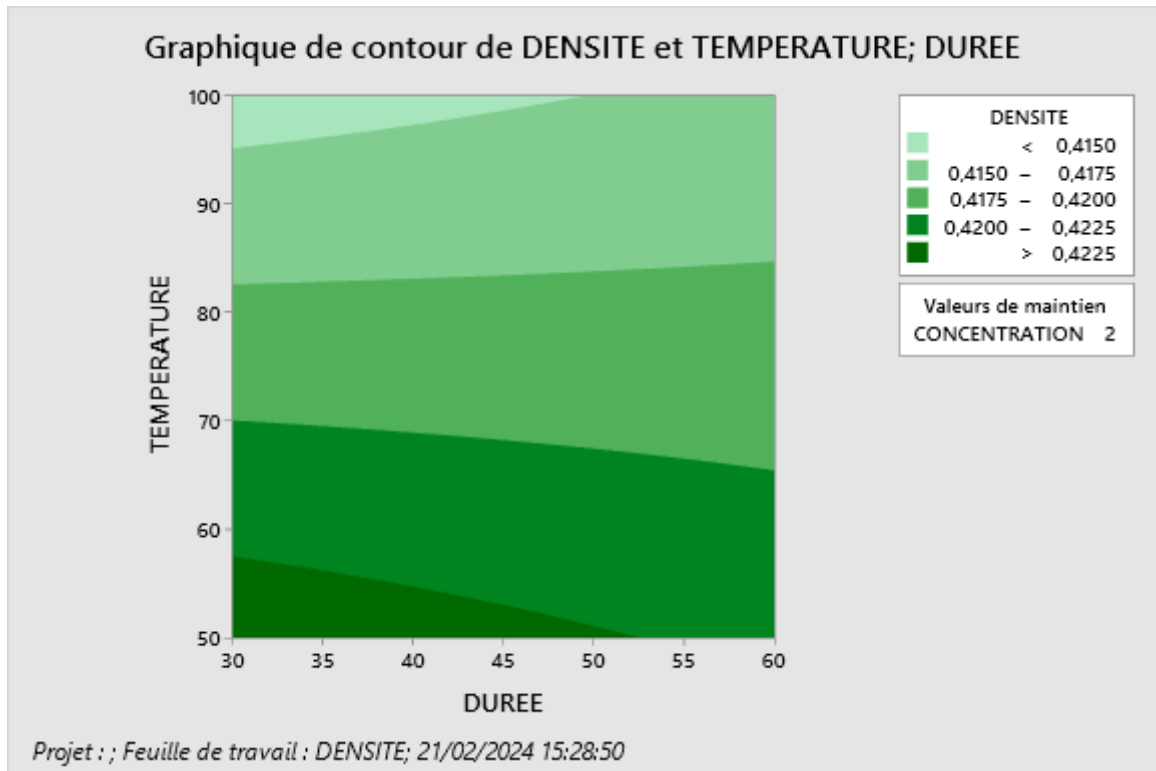
Projet : ; Feuille de travail : DENSITE; 21/02/2024 15:28:12

Diagramme des interactions pour DENSITE Moyennes ajustées

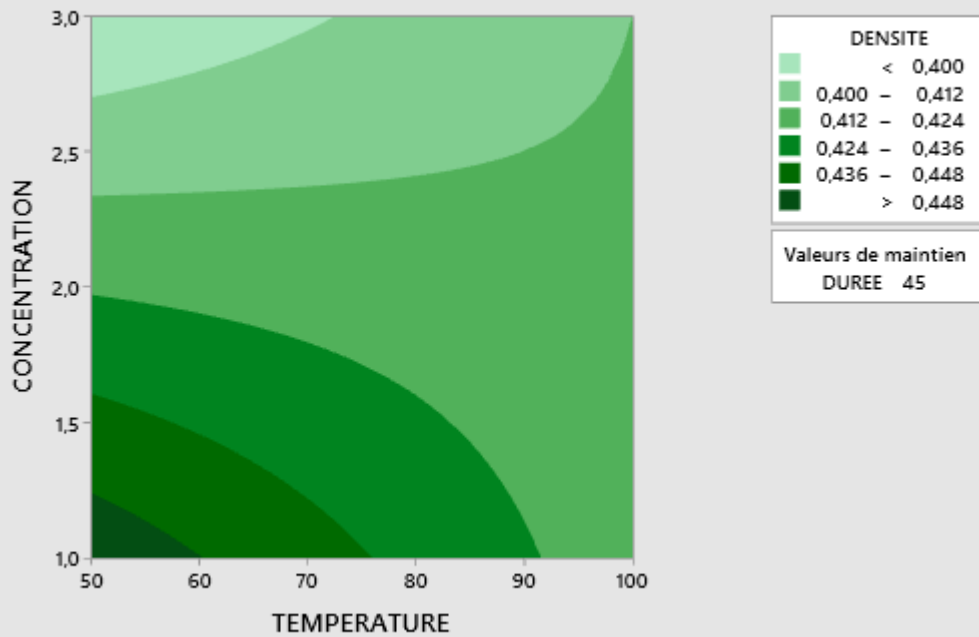


Projet : ; Feuille de travail : DENSITE; 21/02/2024 15:28:12

- **Figure S11. Contour plot of density**



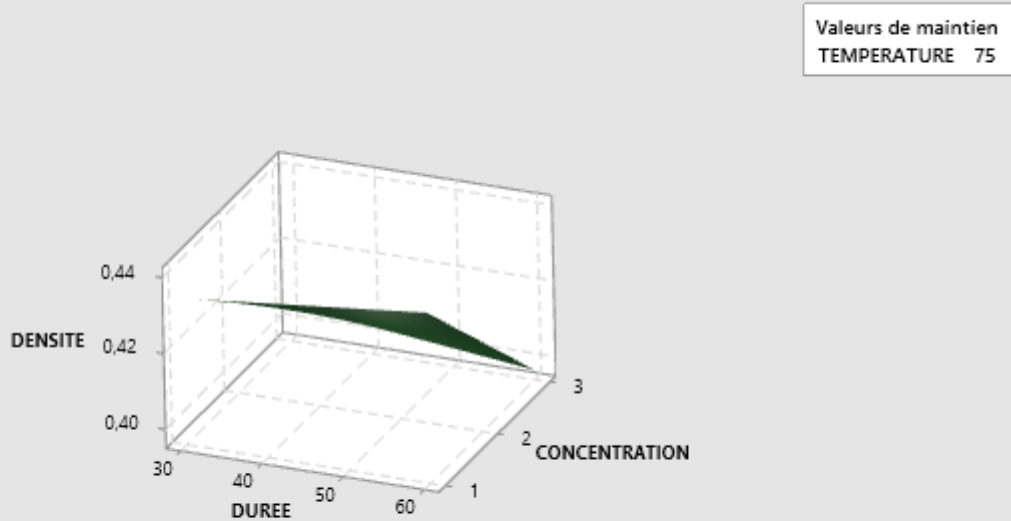
Graphique de contour de DENSITE et CONCENTRATION; TEMPERATURE



Projet : ; Feuille de travail : DENSITE; 21/02/2024 15:28:31

- **Figure S12. Response surface plot of density**

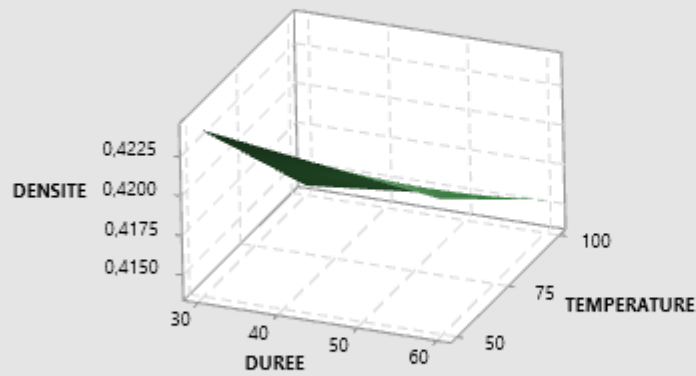
Diagramme de surface de DENSITE et CONCENTRATION; DUREE



Projet : ; Feuille de travail : DENSITE; 21/02/2024 15:29:06

Diagramme de surface de DENSITE et TEMPERATURE; DUREE

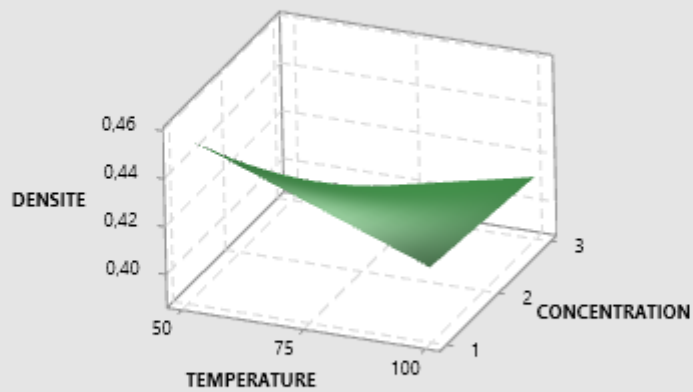
Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : DENSITE; 21/02/2024 15:29:16

Diagramme de surface de DENSITE et CONCENTRATION; TEMPERATURE

Valeurs de maintien
DUREE 45



Projet : ; Feuille de travail : DENSITE; 21/02/2024 15:28:54

7. Young's modulus

This section presents the statistical analyses and graphical representations associated with Young's modulus of the treated fibers.

Tables

- **Table S10. Factorial regression coefficients of Young's modulus**

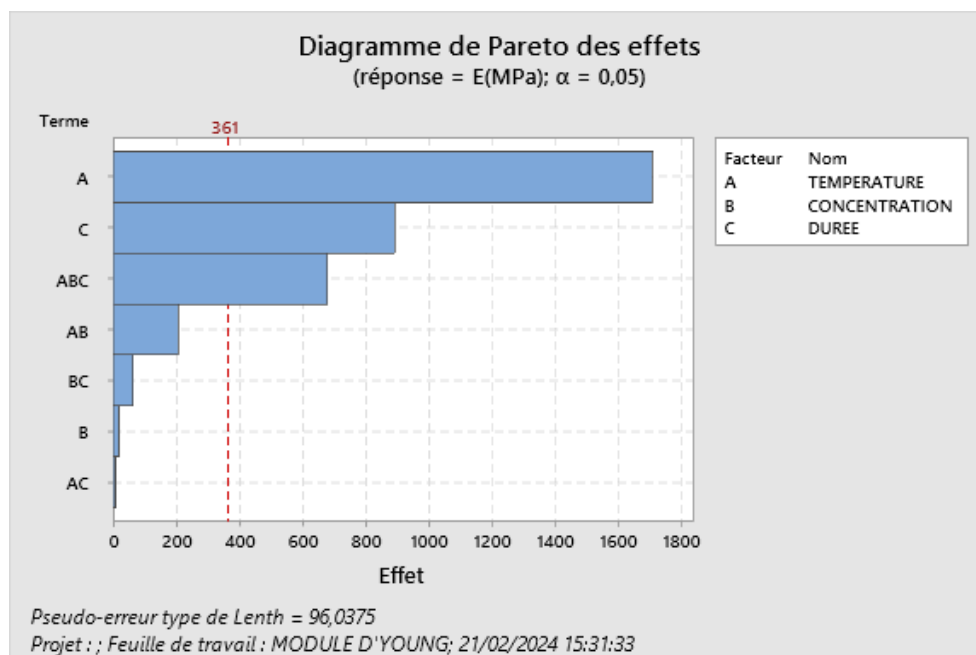
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		4332	*	*	*	
TEMPERATURE	-1705.9	-852.9	*	*	*	1.00
CONCENTRATION	18.725	9.363	*	*	*	1.00
TIME	891.2	445.6	*	*	*	1.00
TEMPERATURE*CONCENTRATION	206.3	103.1	*	*	*	1.00
TEMPERATURE*TIME	8.775	4.388	*	*	*	1.00
CONCENTRATION*TIME	-64.02	-32.01	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	-679.2	-339.6	*	*	*	1.00

- **Table S11. Analysis of variance (ANOVA) of Young's modulus**

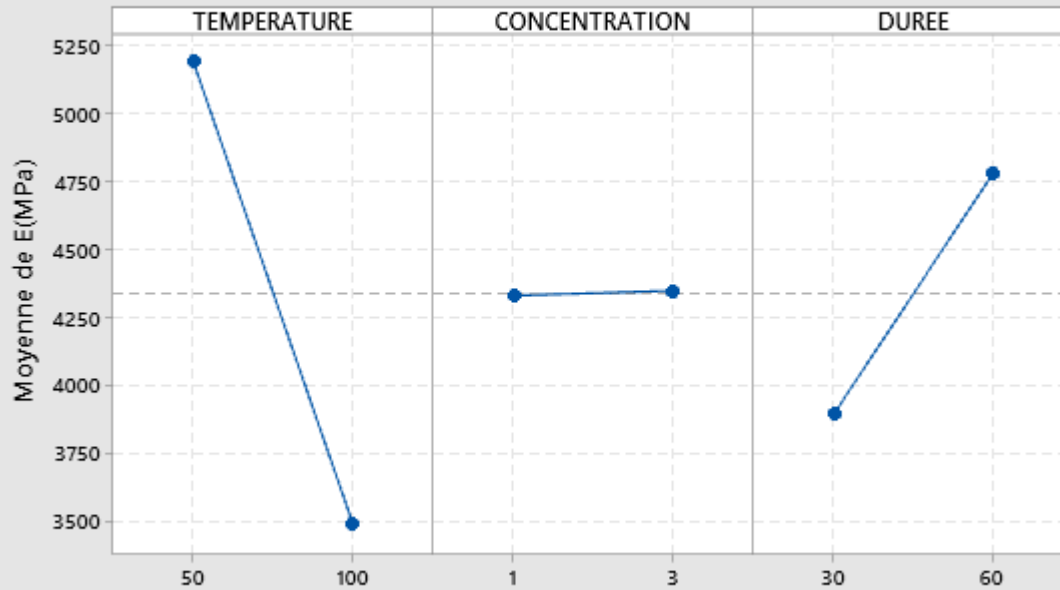
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	8425293	1203613	*	*
Linear	3	7409284	2469761	*	*
TEMPERATURE	1	5820019	5820019	*	*
CONCENTRATION	1	701	701	*	*
TIME	1	1588564	1588564	*	*
2-Way Interactions	3	93451	31150	*	*
TEMPERATURE*CONCENTRATION	1	85099	85099	*	*
TEMPERATURE*TIME	1	154	154	*	*
CONCENTRATION*TIME	1	8198	8198	*	*
3-Way Interactions	1	922557	922557	*	*
TEMPERATURECONCENTRATIONTIME	1	922557	922557	*	*
Error	0	*	*		
Total	7	8425293			

Figures

- **Figure S13. Factorial plot of Young's modulus**

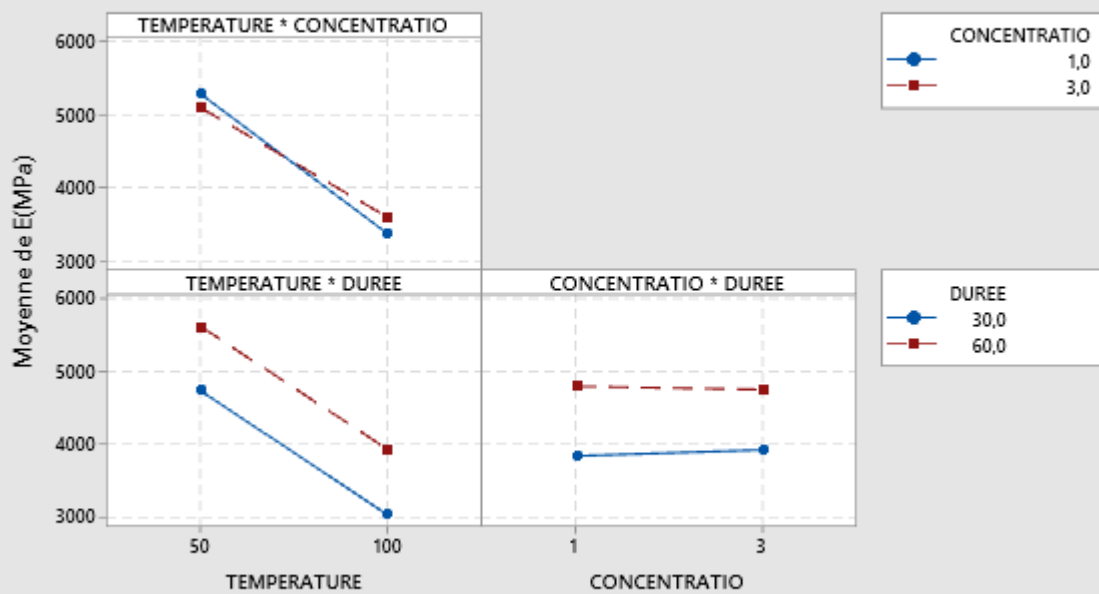


Graphique des effets principaux pour E(MPa)
Moyennes ajustées



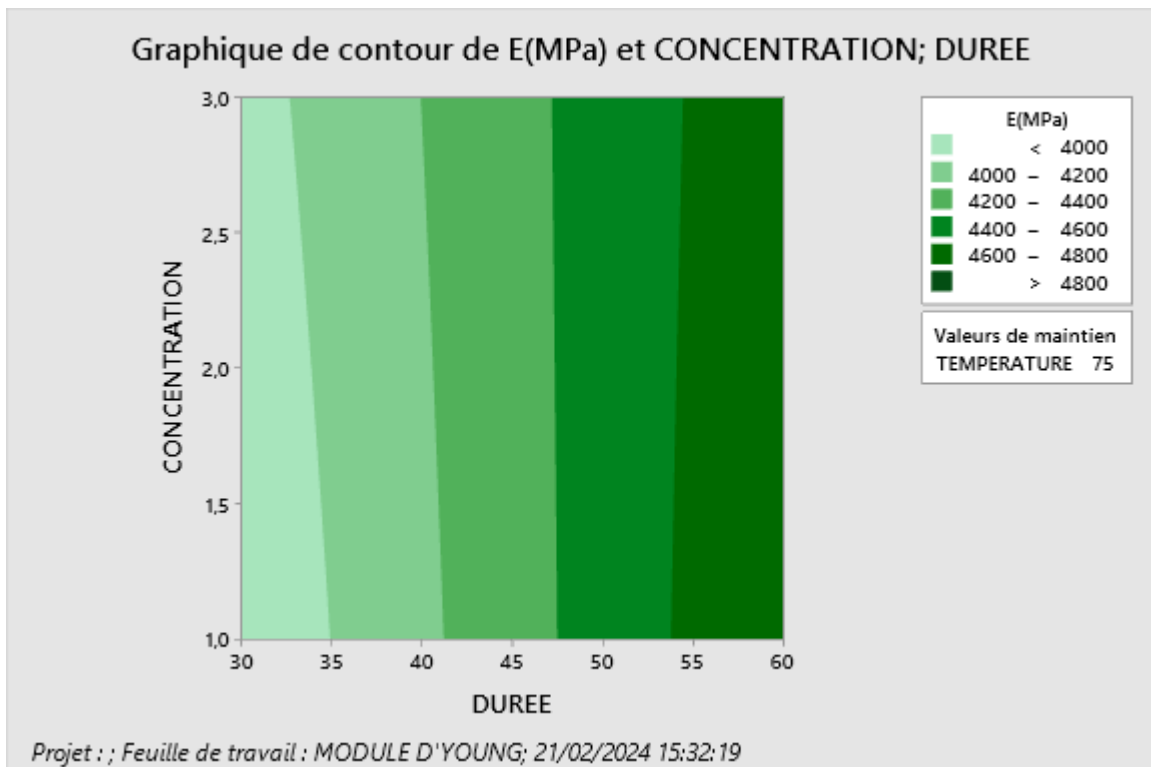
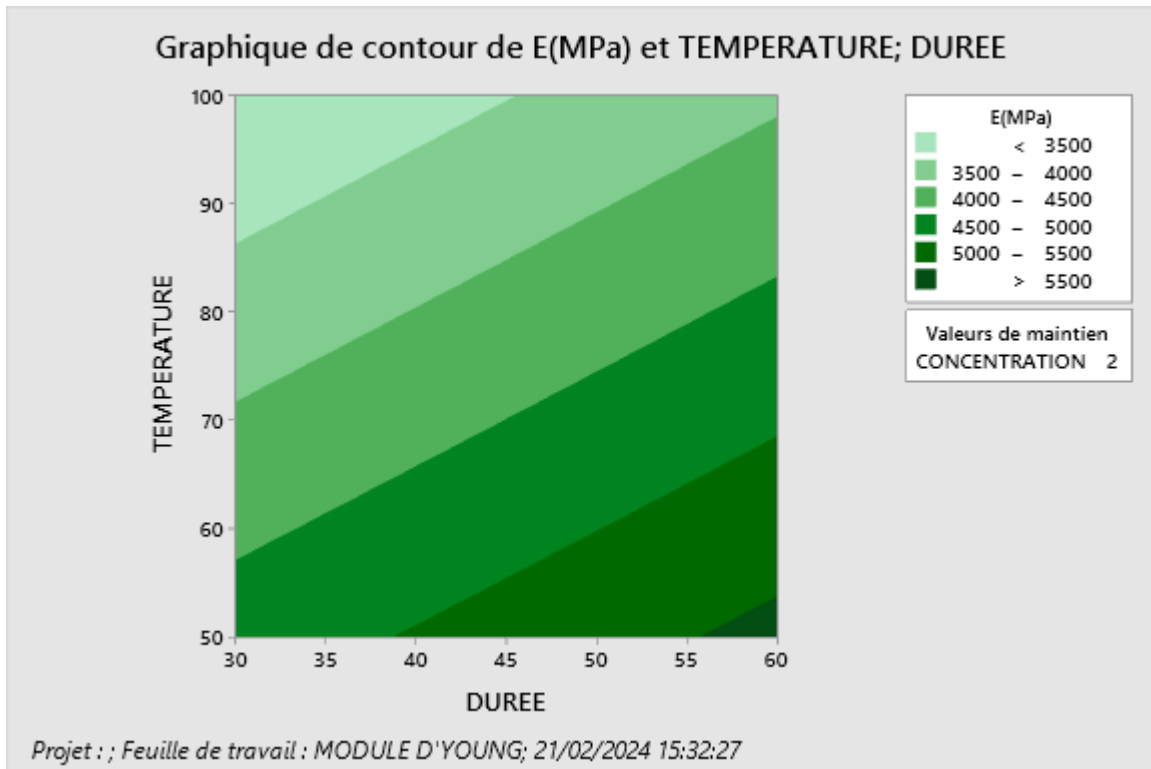
Projet : ; Feuille de travail : MODULE D'YOUNG; 21/02/2024 15:31:52

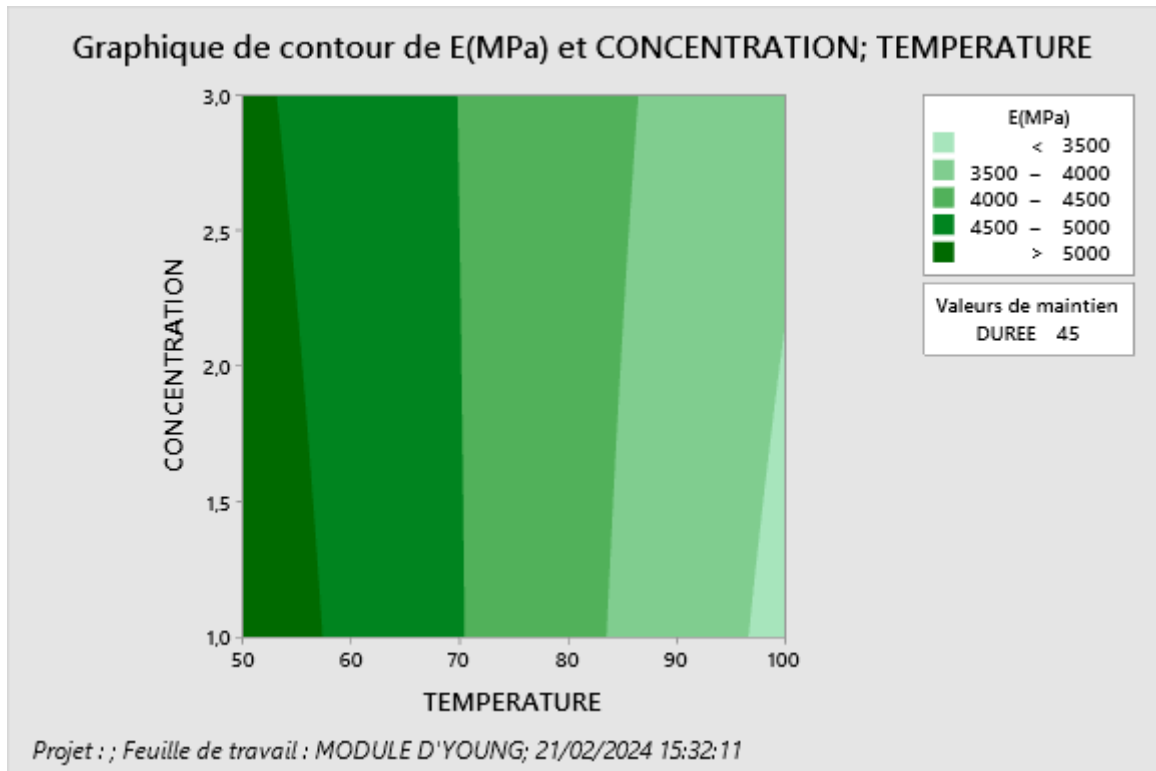
Diagramme des interactions pour E(MPa)
Moyennes ajustées



Projet : ; Feuille de travail : MODULE D'YOUNG; 21/02/2024 15:31:52

- **Figure S14. Contour plot of Young's modulus**





- **Figure S15. Response surface plot of Young's modulus**

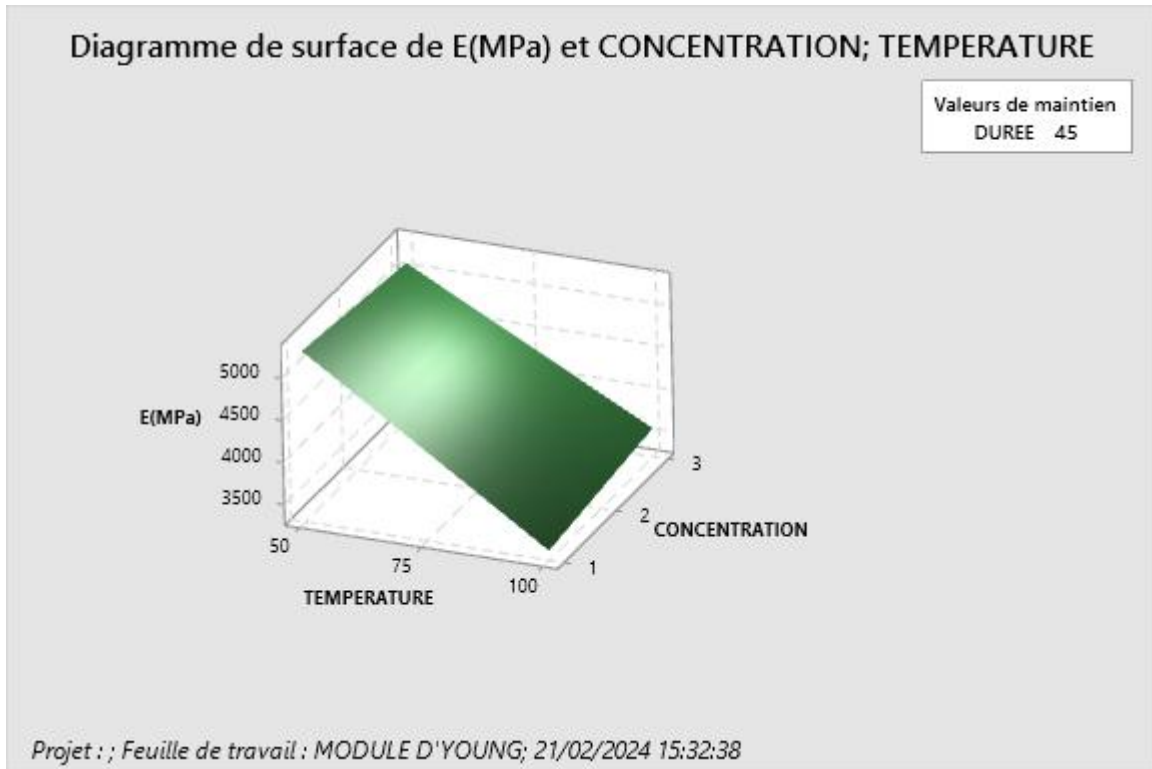
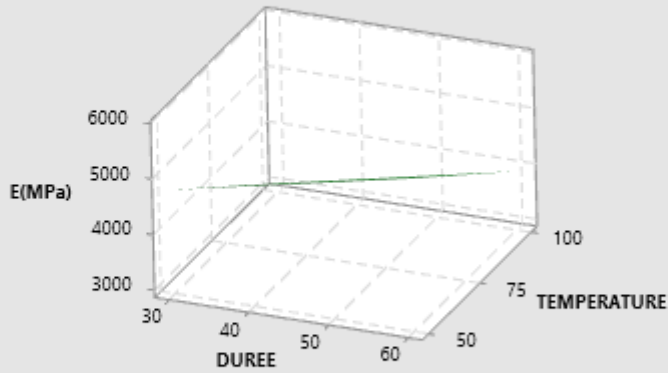


Diagramme de surface de E(MPa) et TEMPERATURE; DUREE

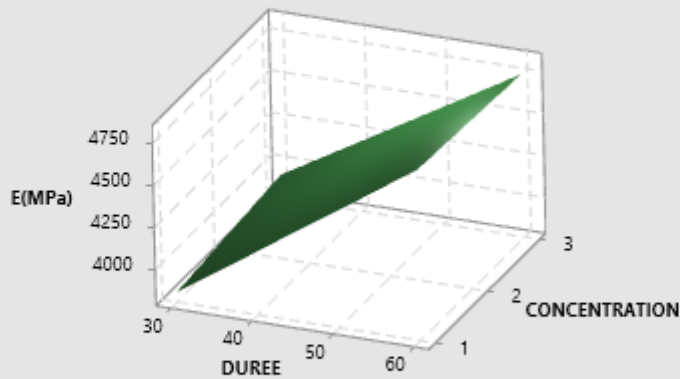
Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : MODULE D'YOUNG; 21/02/2024 15:33:01

Diagramme de surface de E(MPa) et CONCENTRATION; DUREE

Valeurs de maintien
TEMPERATURE 75



Projet : ; Feuille de travail : MODULE D'YOUNG; 21/02/2024 15:32:52

8. Tensile strength

This section presents the statistical analyses and graphical representations related to the tensile strength of the treated fibers.

Tables

- Table S12. Factorial regression coefficients of tensile strength

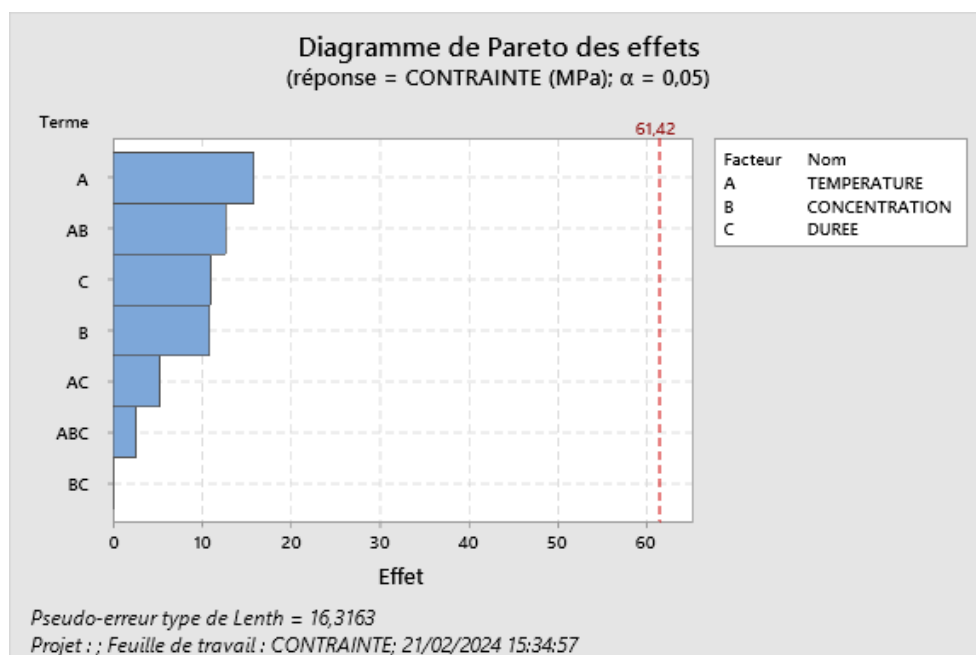
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		93.29	*	*	*	
TEMPERATURE	-15.872	-7.936	*	*	*	1.00
CONCENTRATION	10.878	5.439	*	*	*	1.00
TIME	10.978	5.489	*	*	*	1.00
TEMPERATURE*CONCENTRATION	-12.673	-6.336	*	*	*	1.00
TEMPERATURE*TIME	-5.273	-2.636	*	*	*	1.00
CONCENTRATION*TIME	-0.02250	-0.01125	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	-2.573	-1.286	*	*	*	1.00

- Table S13. Analysis of variance (ANOVA) of tensile strength

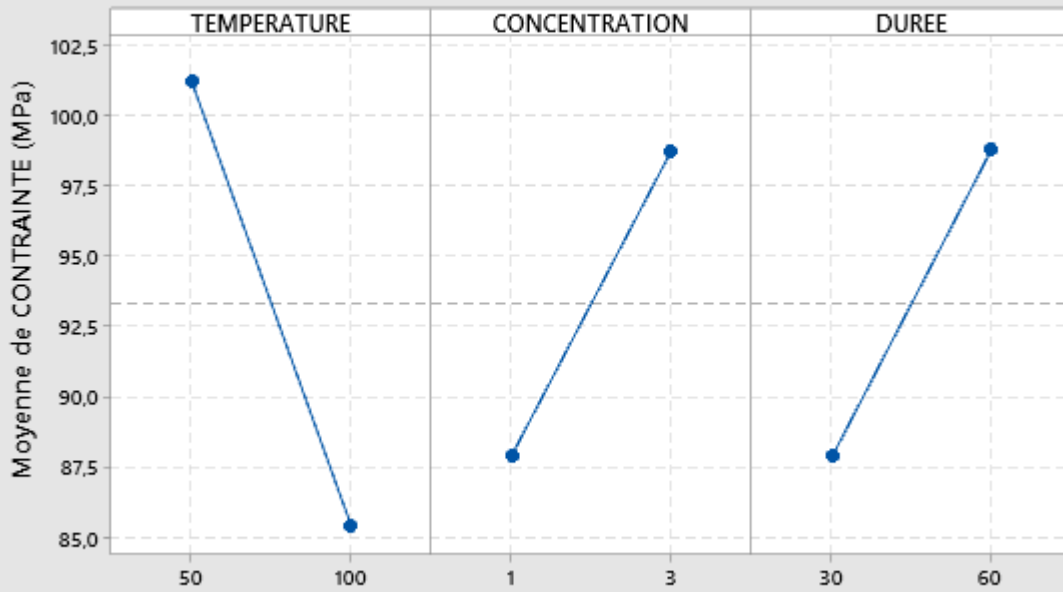
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	1371.54	195.935	*	*
Linear	3	981.52	327.175	*	*
TEMPERATURE	1	503.87	503.873	*	*
CONCENTRATION	1	236.64	236.640	*	*
TIME	1	241.01	241.011	*	*
2-Way Interactions	3	376.78	125.595	*	*
TEMPERATURE*CONCENTRATION	1	321.18	321.185	*	*
TEMPERATURE*TIME	1	55.60	55.599	*	*
CONCENTRATION*TIME	1	0.00	0.001	*	*
3-Way Interactions	1	13.24	13.236	*	*
TEMPERATURECONCENTRATIONTIME	1	13.24	13.236	*	*
Error	0	*	*		
Total	7	1371.54			

Figures

- Figure S16. Factorial plot of tensile strength

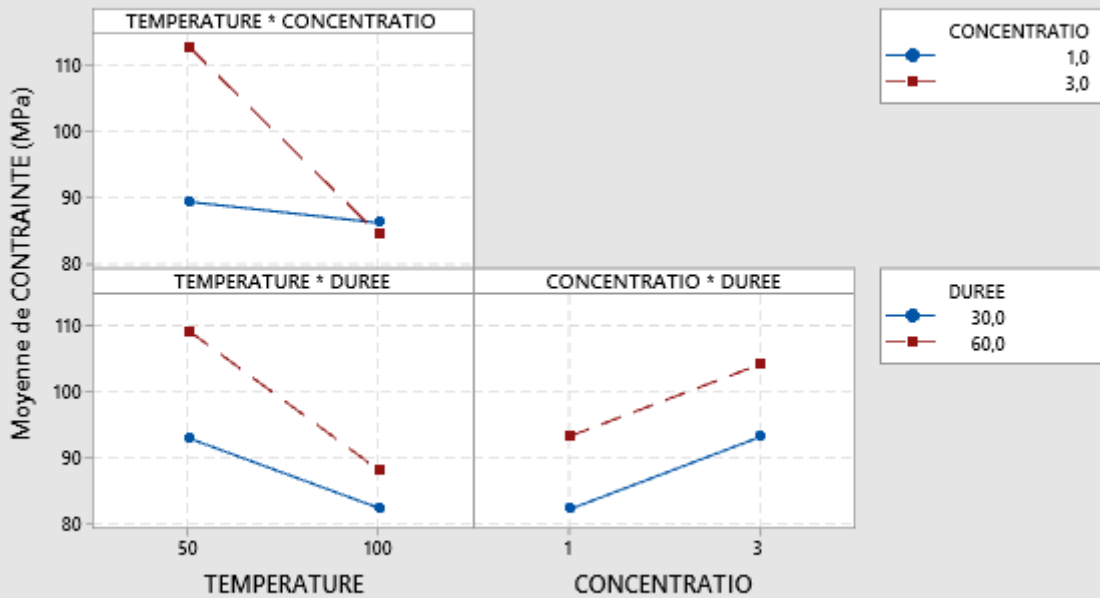


Graphique des effets principaux pour CONTRAINTE (MPa) Moyennes ajustées



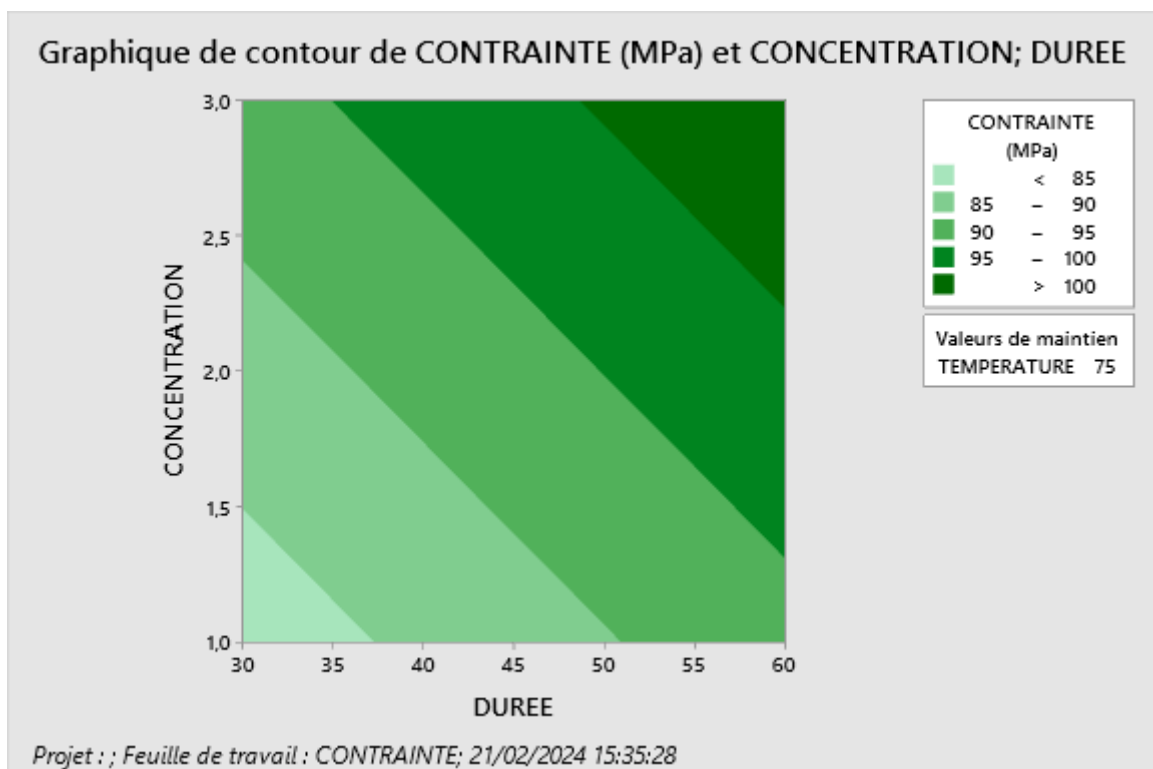
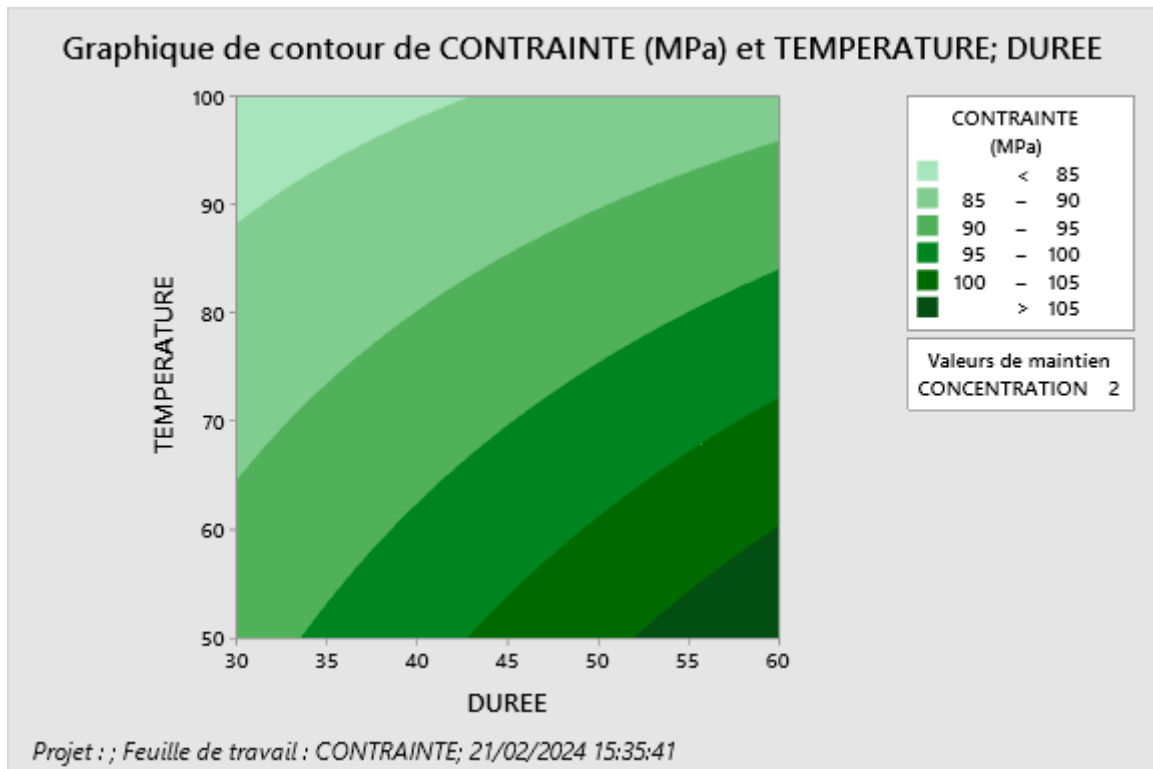
Projet : ; Feuille de travail : CONTRAINTE; 21/02/2024 15:35:10

Diagramme des interactions pour CONTRAINTE (MPa) Moyennes ajustées

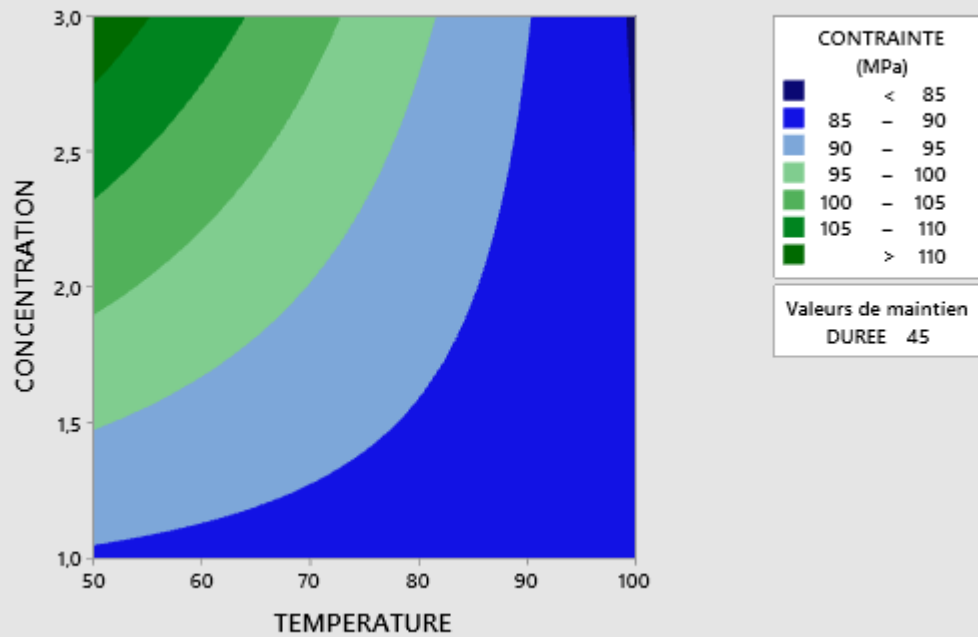


Projet : ; Feuille de travail : CONTRAINTE; 21/02/2024 15:35:10

- **Figure S17. Contour plot of tensile strength**



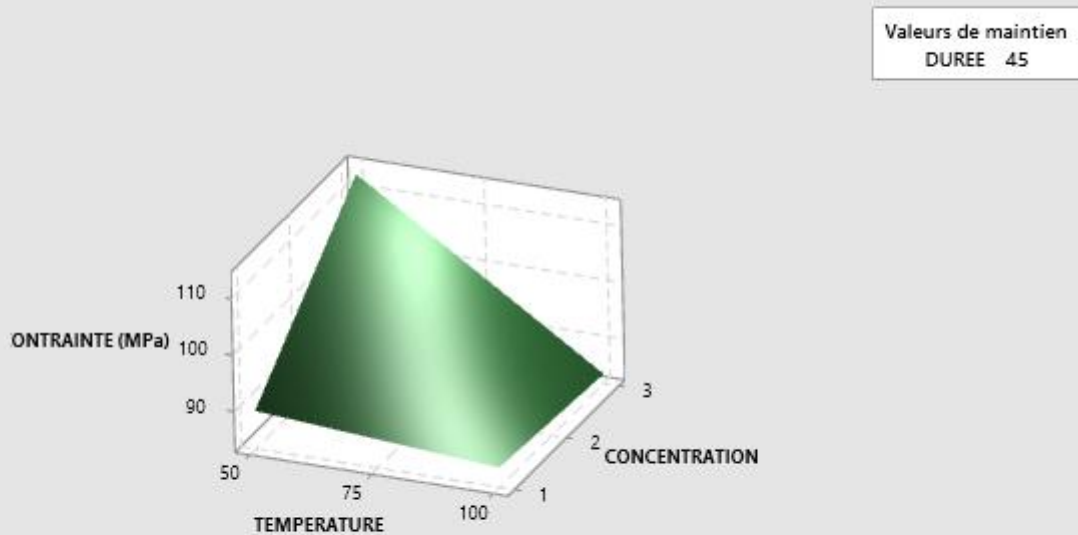
Graphique de contour de CONTRAINTE (MPa) et CONCENTRATION; TEMPERATURE



Projet : ; Feuille de travail : CONTRAINTE; 21/02/2024 15:35:18

- Figure S18. Response surface plot of tensile strength

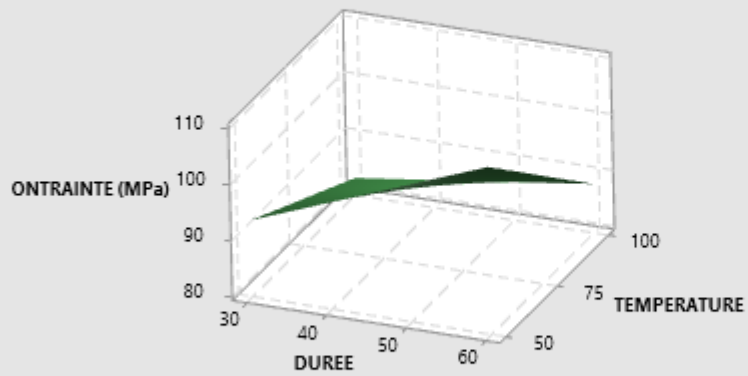
Diagramme de surface de CONTRAINTE (MPa) et CONCENTRATION; TEMPERATURE



Projet : ; Feuille de travail : CONTRAINTE; 21/02/2024 15:35:46

Diagramme de surface de CONTRAINTE (MPa) et TEMPERATURE; DUREE

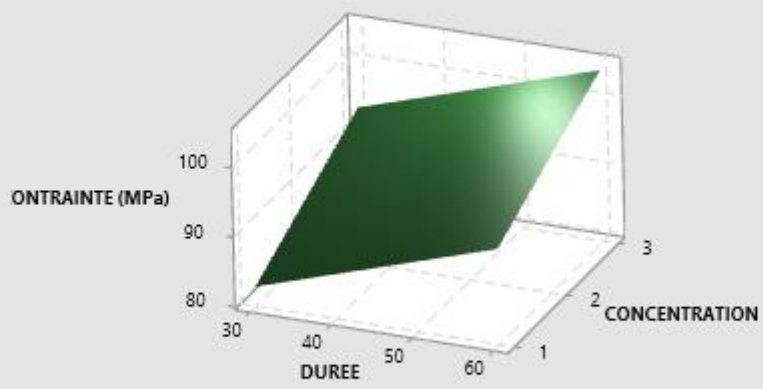
Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : CONTRAINTE; 21/02/2024 15:36:04

Diagramme de surface de CONTRAINTE (MPa) et CONCENTRATION; DUREE

Valeurs de maintien
TEMPERATURE 75



Projet : ; Feuille de travail : CONTRAINTE; 21/02/2024 15:35:55

9. Elongation

This section presents the statistical analyses and graphical representations associated with the elongation of the treated fibers.

Tables

- Table S14. Factorial regression coefficients of elongation

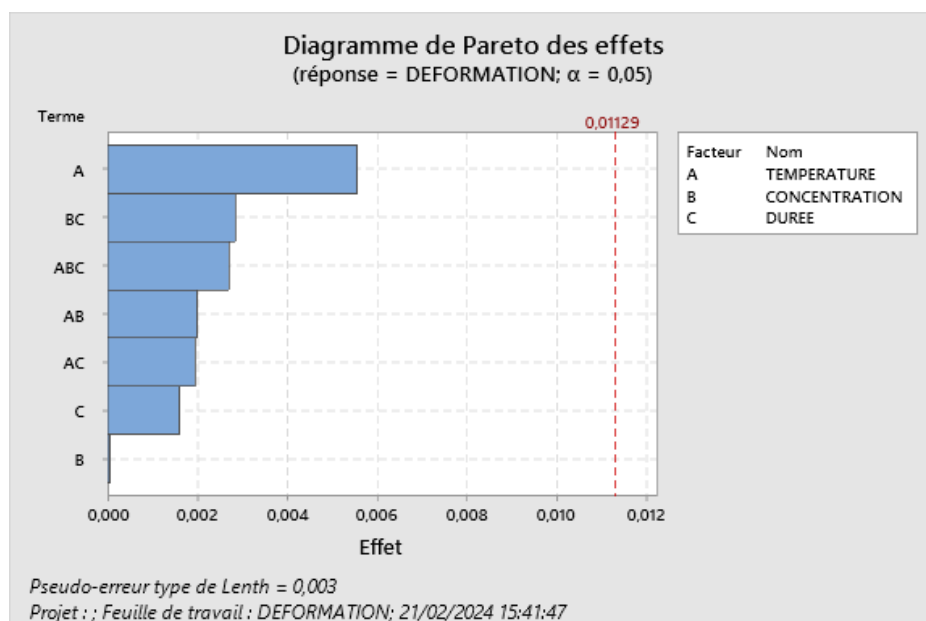
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		0.03010	*	*	*	
TEMPERATURE	0.005550	0.002775	*	*	*	1.00
CONCENTRATION	0.000050	0.000025	*	*	*	1.00
TIME	-0.001600	-0.000800	*	*	*	1.00
TEMPERATURE*CONCENTRATION	-0.002000	-0.001000	*	*	*	1.00
TEMPERATURE*TIME	-0.001950	-0.000975	*	*	*	1.00
CONCENTRATION*TIME	0.002850	0.001425	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	0.002700	0.001350	*	*	*	1.00

- Table S15. Analysis of variance (ANOVA) of elongation

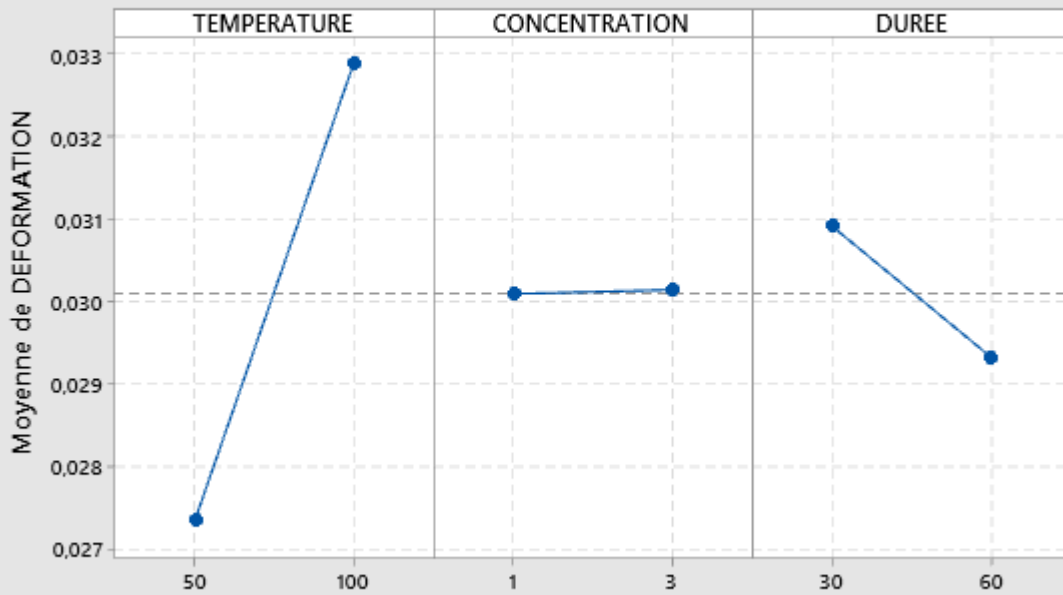
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	0.000113	0.000016	*	*
Linear	3	0.000067	0.000022	*	*
TEMPERATURE	1	0.000062	0.000062	*	*
CONCENTRATION	1	0.000000	0.000000	*	*
TIME	1	0.000005	0.000005	*	*
2-Way Interactions	3	0.000032	0.000011	*	*
TEMPERATURE*CONCENTRATION	1	0.000008	0.000008	*	*
TEMPERATURE*TIME	1	0.000008	0.000008	*	*
CONCENTRATION*TIME	1	0.000016	0.000016	*	*
3-Way Interactions	1	0.000015	0.000015	*	*
TEMPERATURECONCENTRATIONTIME	1	0.000015	0.000015	*	*
Error	0	*	*		
Total	7	0.000113			

Figures

- Figure S19. Factorial plot of elongation

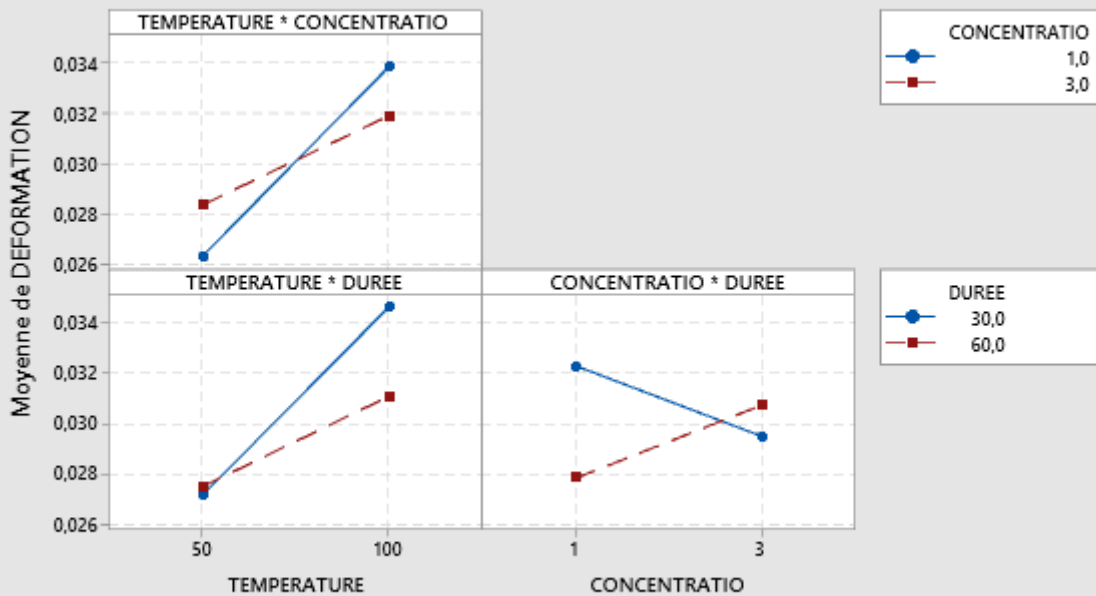


Graphique des effets principaux pour DEFORMATION Moyennes ajustées



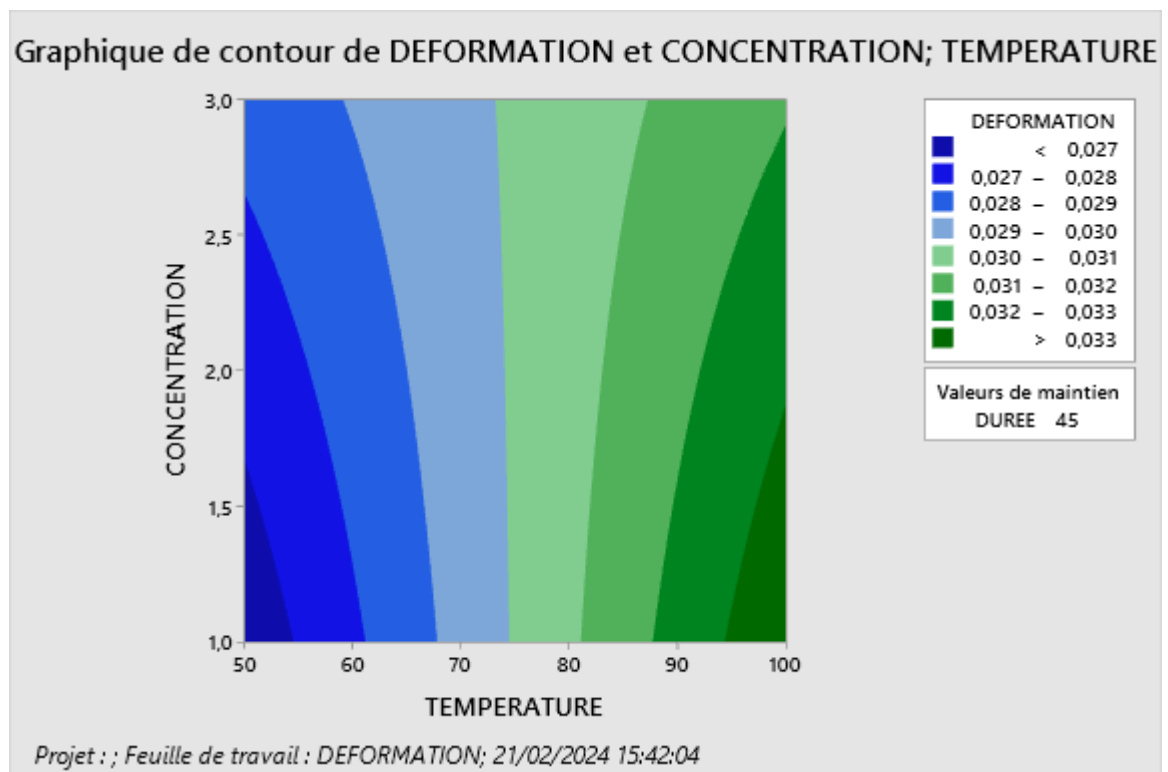
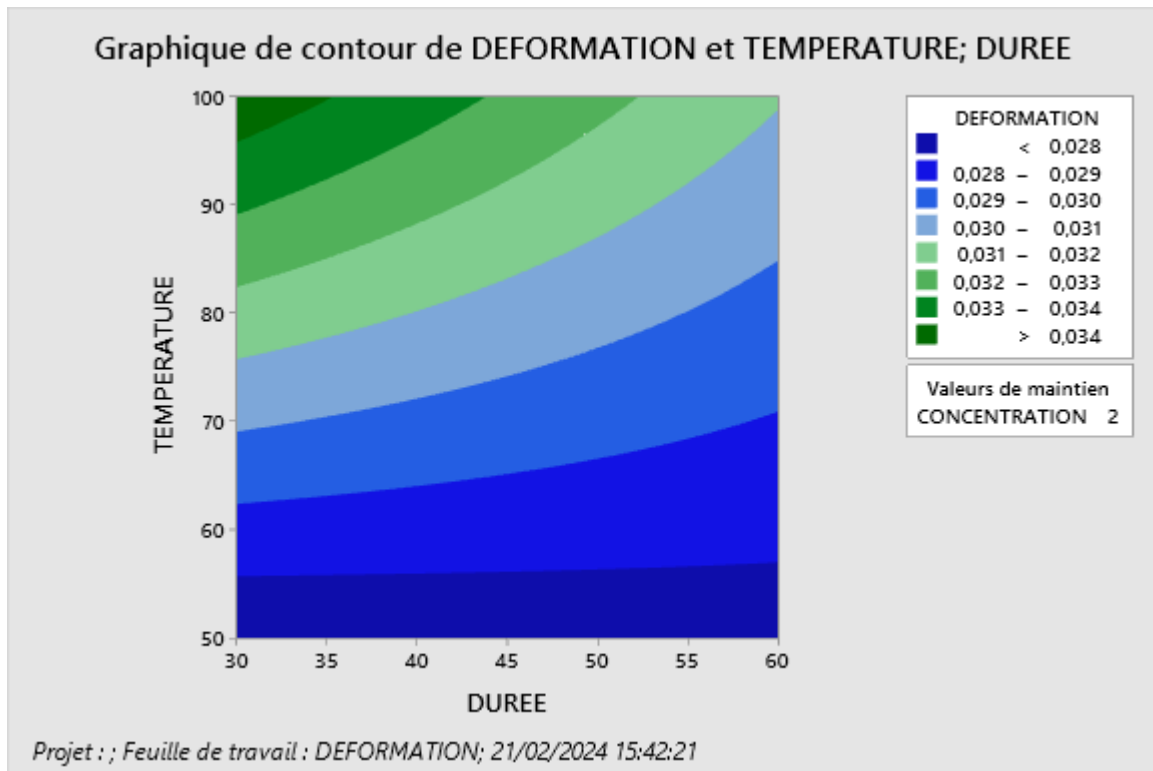
Projet : ; Feuille de travail : DEFORMATION; 21/02/2024 15:41:57

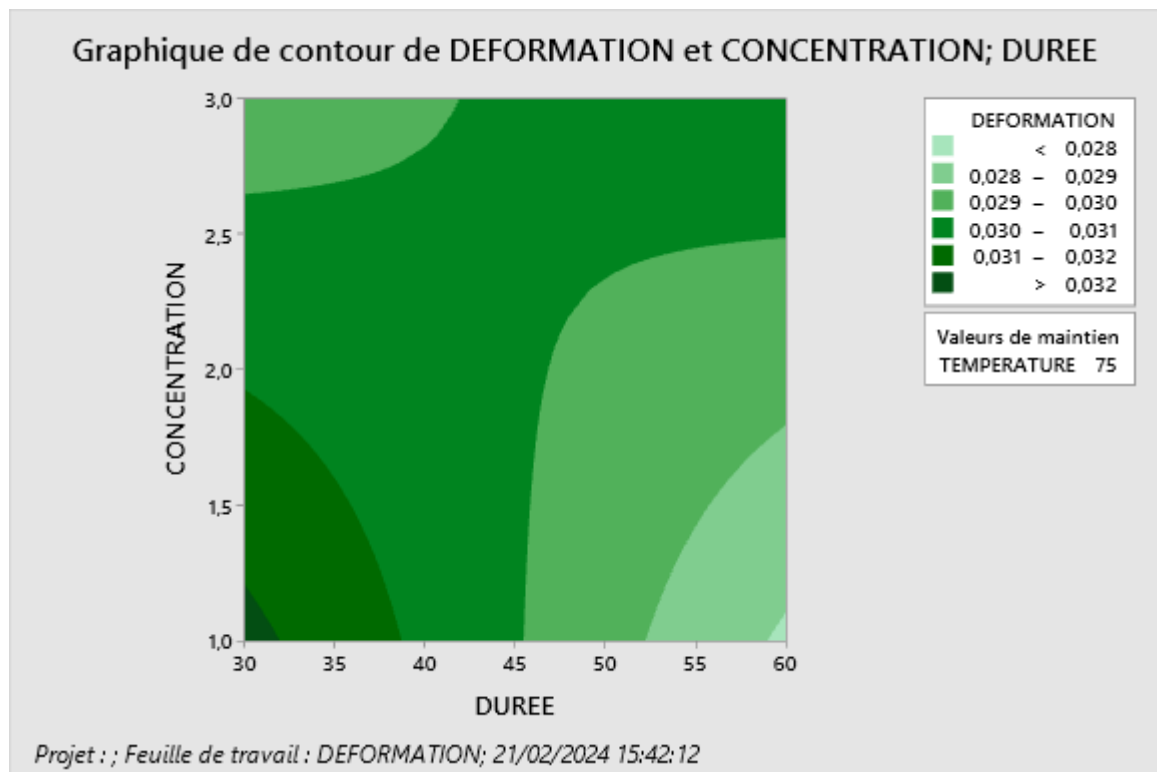
Diagramme des interactions pour DEFORMATION Moyennes ajustées



Projet : ; Feuille de travail : DEFORMATION; 21/02/2024 15:41:57

- **Figure S20. Contour plot of elongation**





- **Figure S21. Response surface plot of elongation**

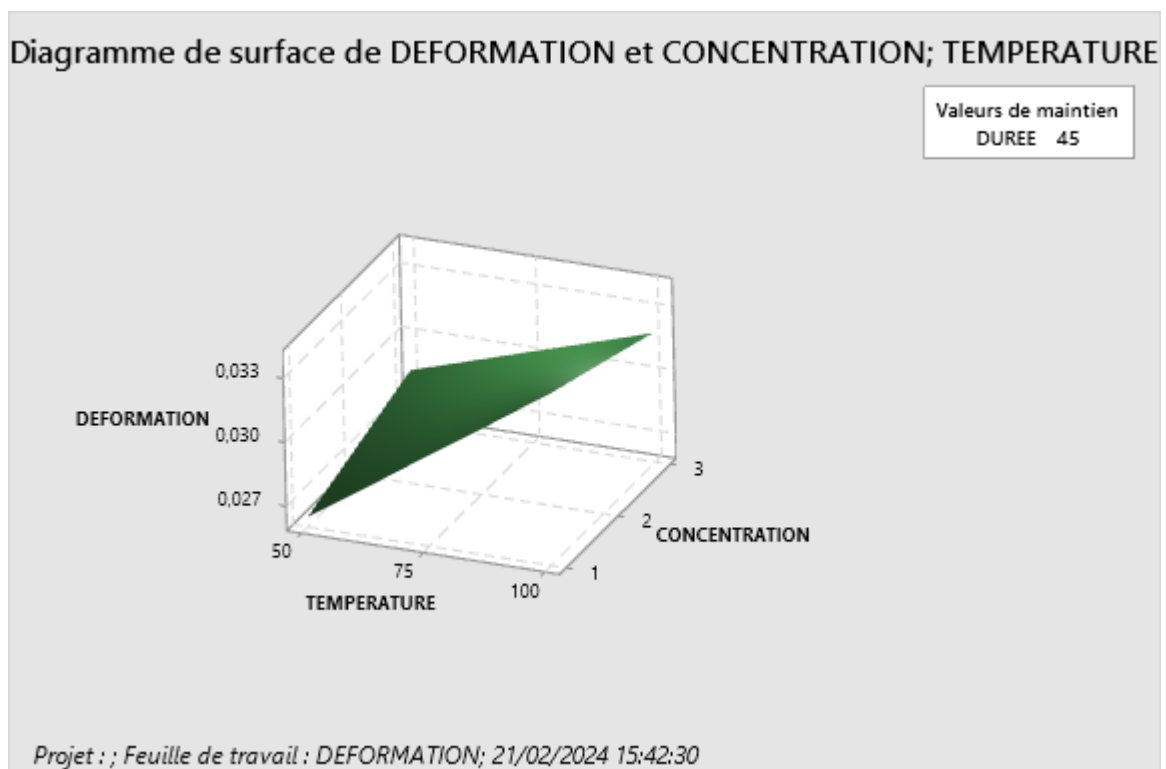
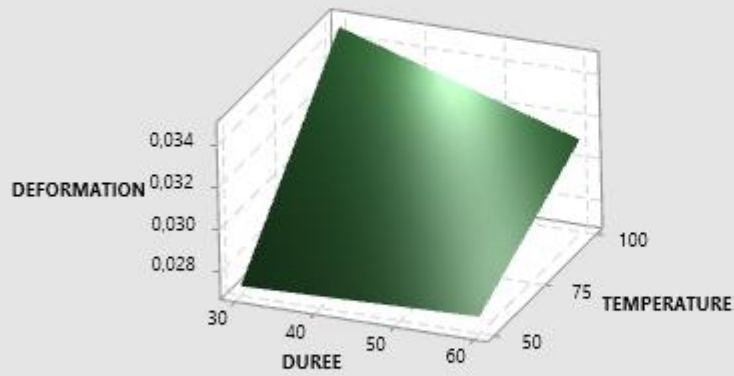


Diagramme de surface de DEFORMATION et TEMPERATURE; DUREE

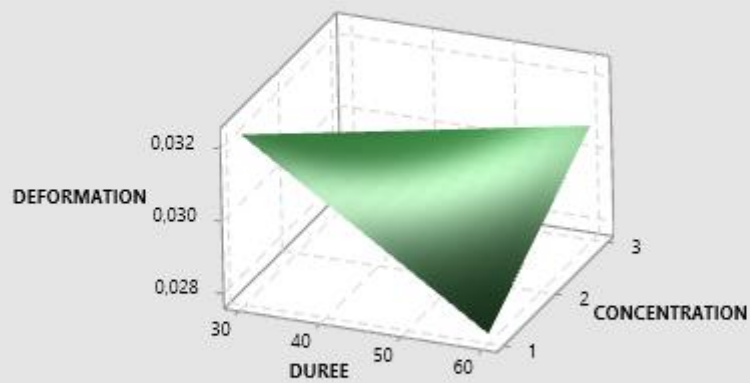
Valeurs de maintien
CONCENTRATION 2



Projet : ; Feuille de travail : DEFORMATION; 21/02/2024 15:42:50

Diagramme de surface de DEFORMATION et CONCENTRATION; DUREE

Valeurs de maintien
TEMPERATURE 75



Projet : ; Feuille de travail : DEFORMATION; 21/02/2024 15:42:40

10. Lignin content

This section presents the statistical analyses and graphical representations related to the lignin content of the treated fibers.

Tables

- Table S16. Factorial regression coefficients of lignin content

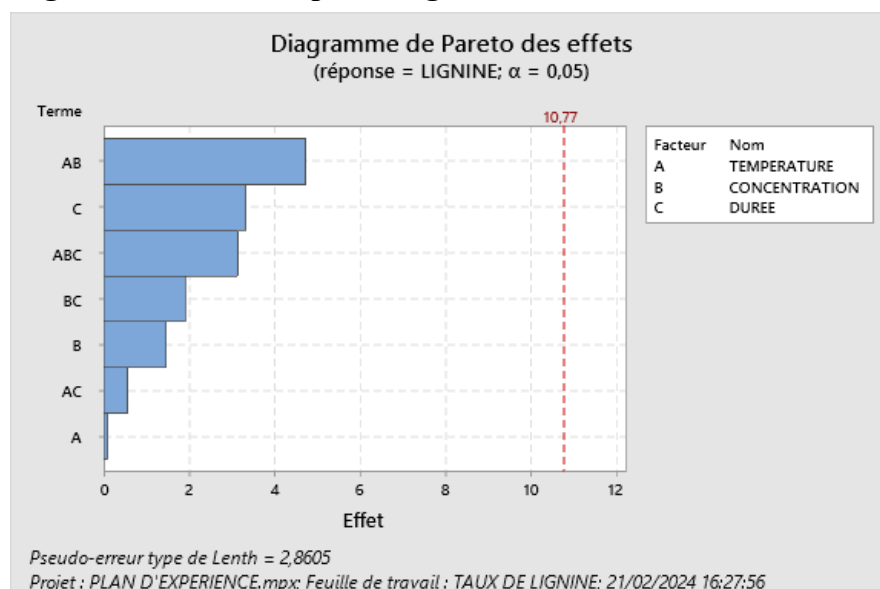
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		23.04	*	*	*	
TEMPERATURE	0.10300	0.05150	*	*	*	1.00
CONCENTRATION	1.4630	0.7315	*	*	*	1.00
TIME	-3.337	-1.669	*	*	*	1.00
TEMPERATURE*CONCENTRATION	4.727	2.364	*	*	*	1.00
TEMPERATURE*TIME	0.5570	0.2785	*	*	*	1.00
CONCENTRATION*TIME	1.9070	0.9535	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	-3.137	-1.568	*	*	*	1.00

- Table S17. Analysis of variance (ANOVA) of lignin content

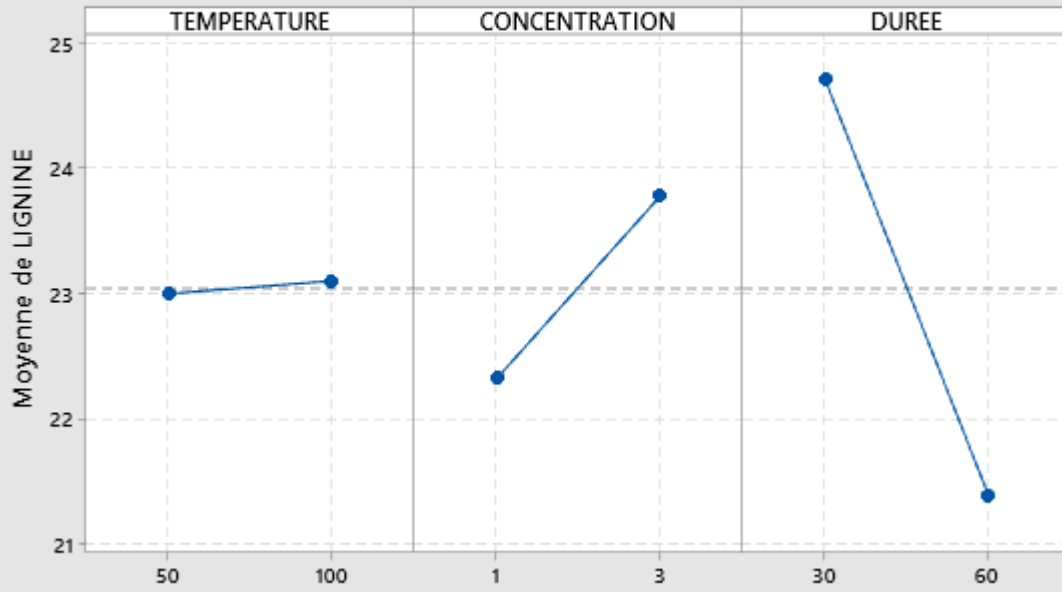
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	98.8375	14.1196	*	*
Linear	3	26.5731	8.8577	*	*
TEMPERATURE	1	0.0212	0.0212	*	*
CONCENTRATION	1	4.2807	4.2807	*	*
TIME	1	22.2711	22.2711	*	*
2-Way Interactions	3	52.5829	17.5276	*	*
TEMPERATURE*CONCENTRATION	1	44.6891	44.6891	*	*
TEMPERATURE*TIME	1	0.6205	0.6205	*	*
CONCENTRATION*TIME	1	7.2733	7.2733	*	*
3-Way Interactions	1	19.6815	19.6815	*	*
TEMPERATURECONCENTRATIONTIME	1	19.6815	19.6815	*	*
Error	0	*	*		
Total	7	98.8375			

Figures

- Figure S22. Factorial plot of lignin content

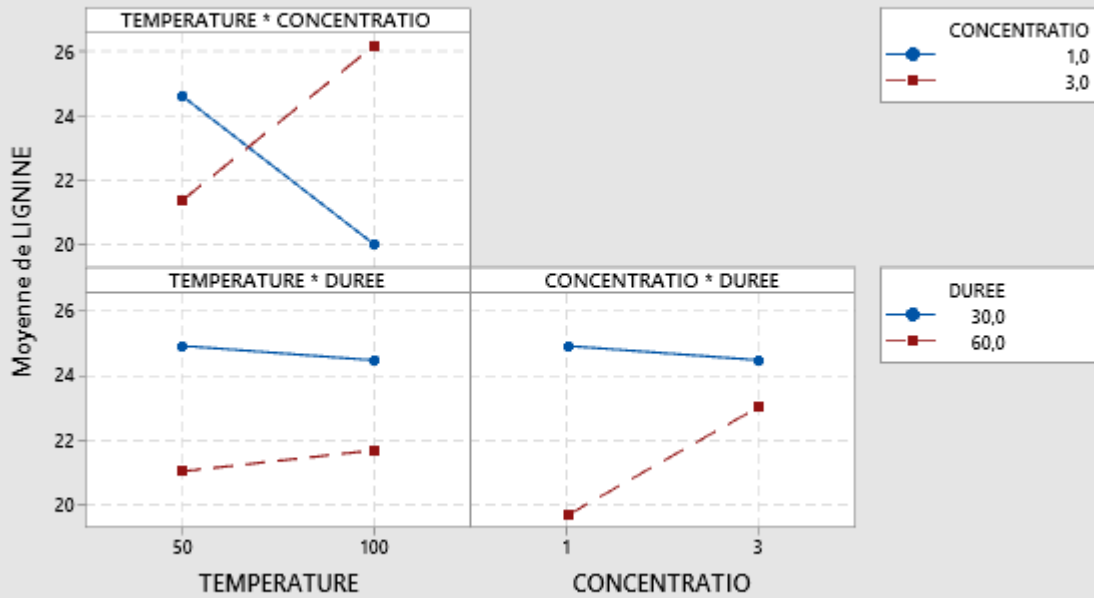


Graphique des effets principaux pour LIGNINE Moyennes ajustées



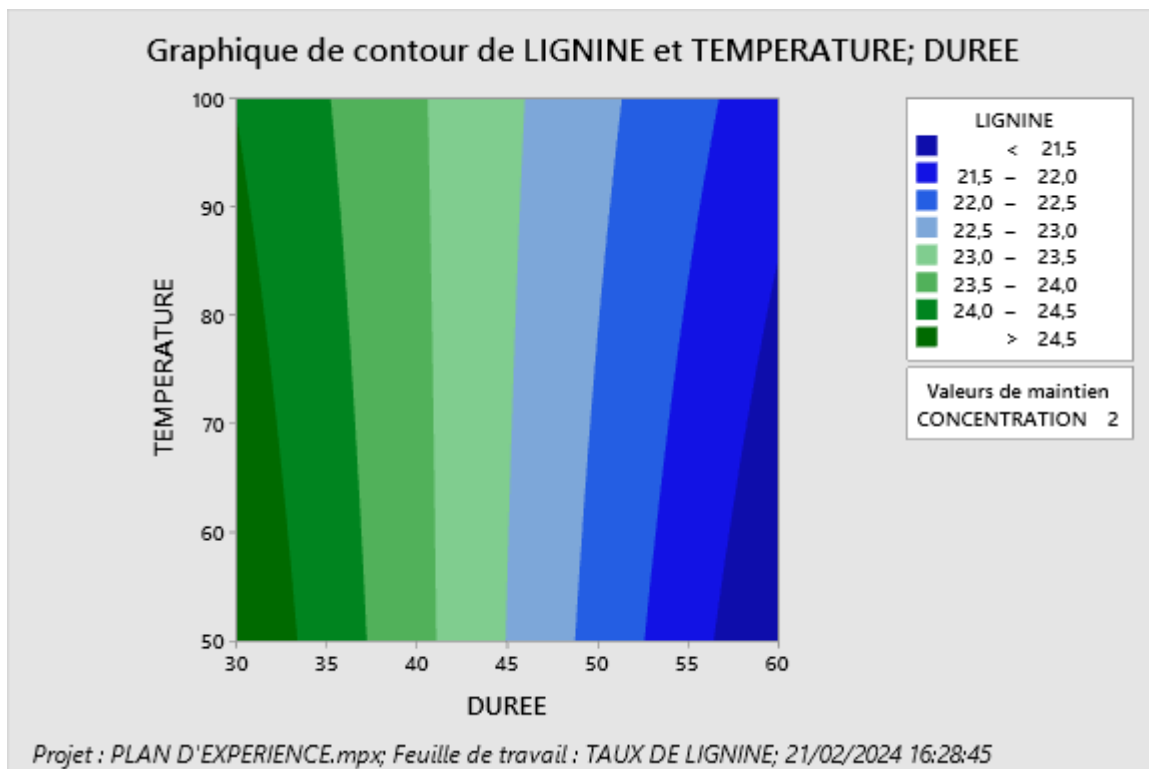
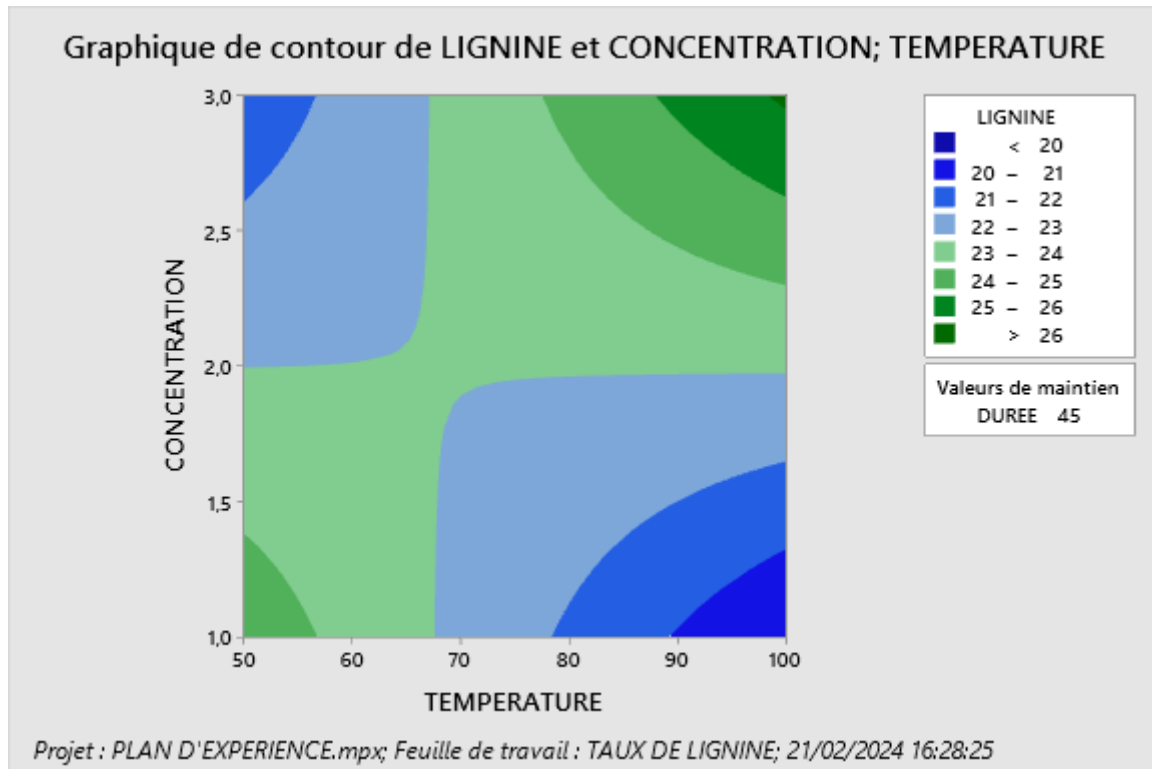
Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE LIGNINE; 21/02/2024 16:28:14

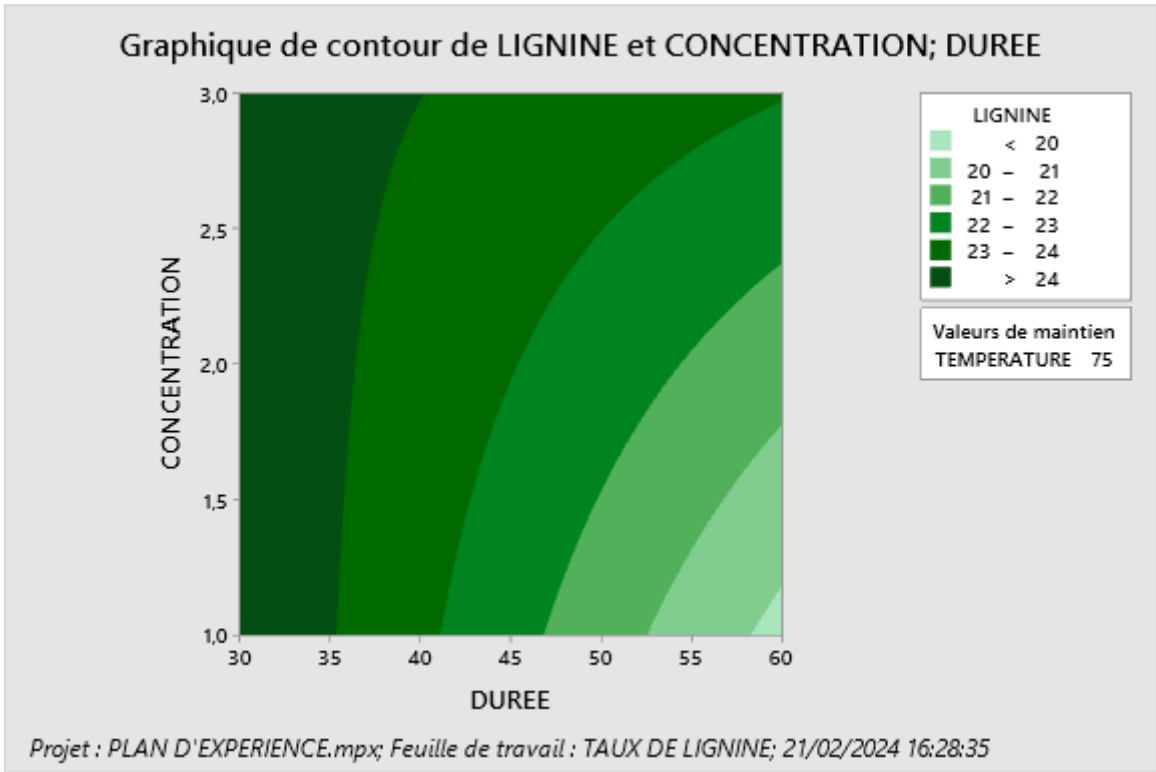
Diagramme des interactions pour LIGNINE Moyennes ajustées



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE LIGNINE; 21/02/2024 16:28:14

- **Figure S23. Contour plot of lignin content**





- **Figure S24. Response surface plot of lignin content**

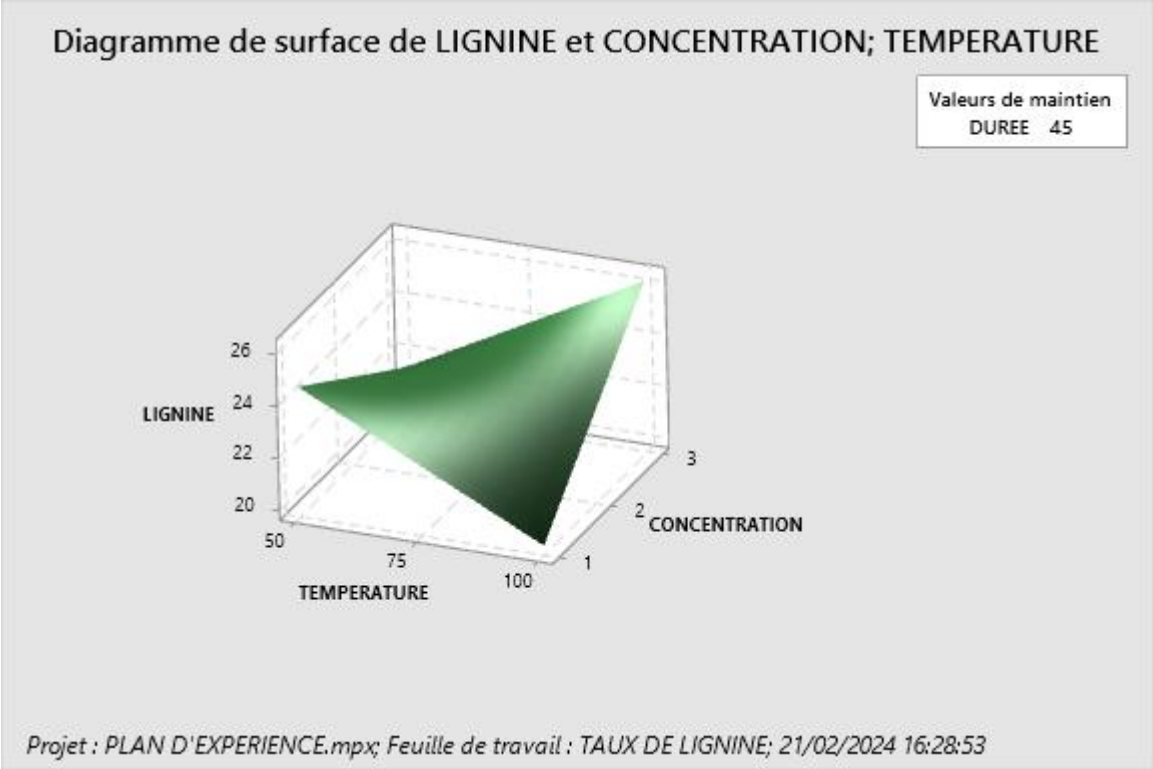
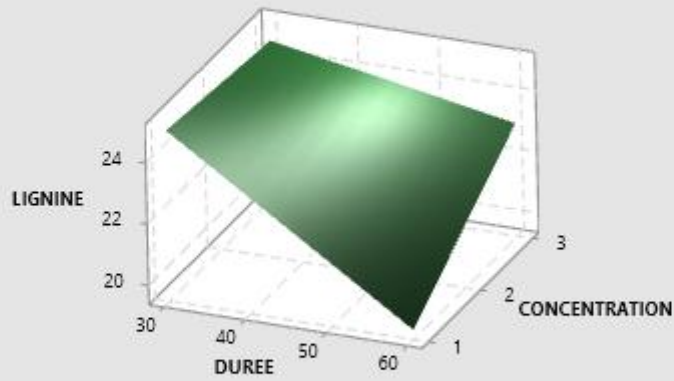


Diagramme de surface de LIGNINE et CONCENTRATION; DUREE

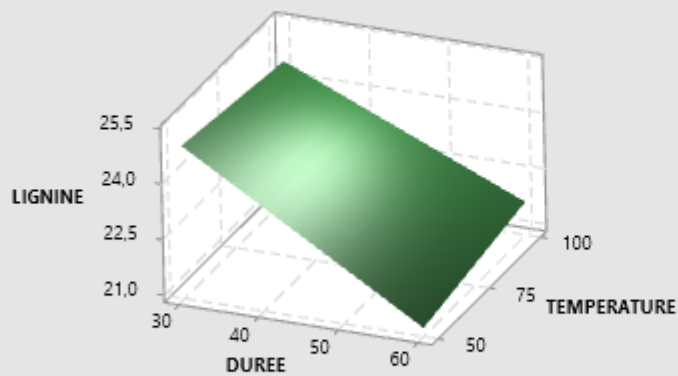
Valeurs de maintien
TEMPERATURE 75



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE LIGNINE; 21/02/2024 16:29:01

Diagramme de surface de LIGNINE et TEMPERATURE; DUREE

Valeurs de maintien
CONCENTRATION 2



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE LIGNINE; 21/02/2024 16:29:09

11. Hemicellulose content

This section presents the statistical analyses and graphical representations associated with the hemicellulose content of the treated fibers.

Tables

- **Table S18. Factorial regression coefficients of hemicellulose content**

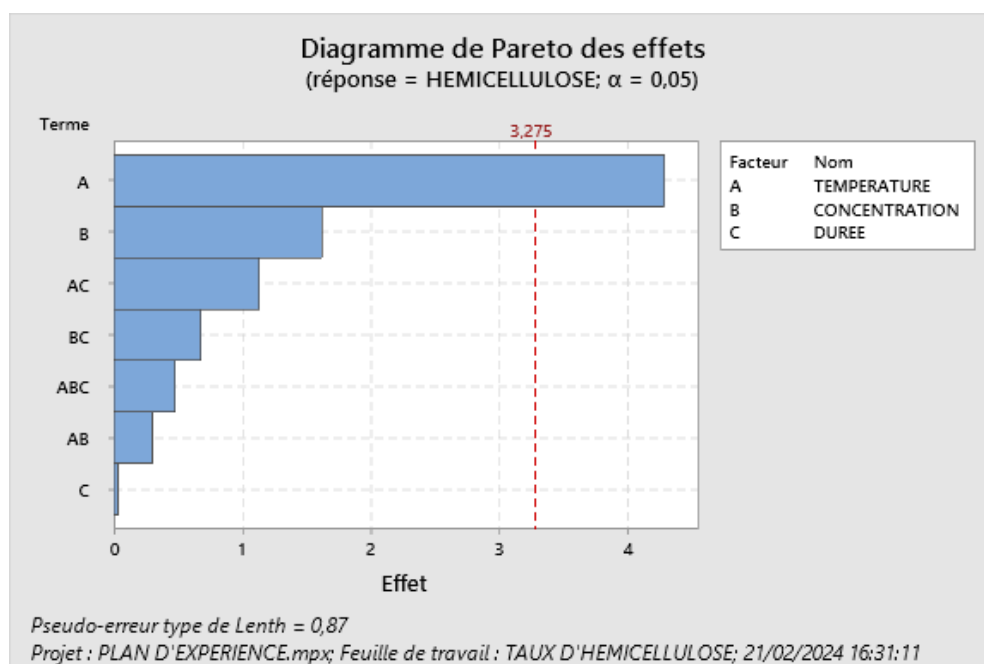
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		7.832	*	*	*	
TEMPERATURE	-4.285	-2.143	*	*	*	1.00
CONCENTRATION	-1.6197	-0.8099	*	*	*	1.00
TIME	0.03525	0.01763	*	*	*	1.00
TEMPERATURE*CONCENTRATION	-0.2997	-0.1499	*	*	*	1.00
TEMPERATURE*TIME	-1.1347	-0.5674	*	*	*	1.00
CONCENTRATION*TIME	-0.6803	-0.3401	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	0.4798	0.2399	*	*	*	1.00

- **Table S19. Analysis of variance (ANOVA) of hemicellulose content**

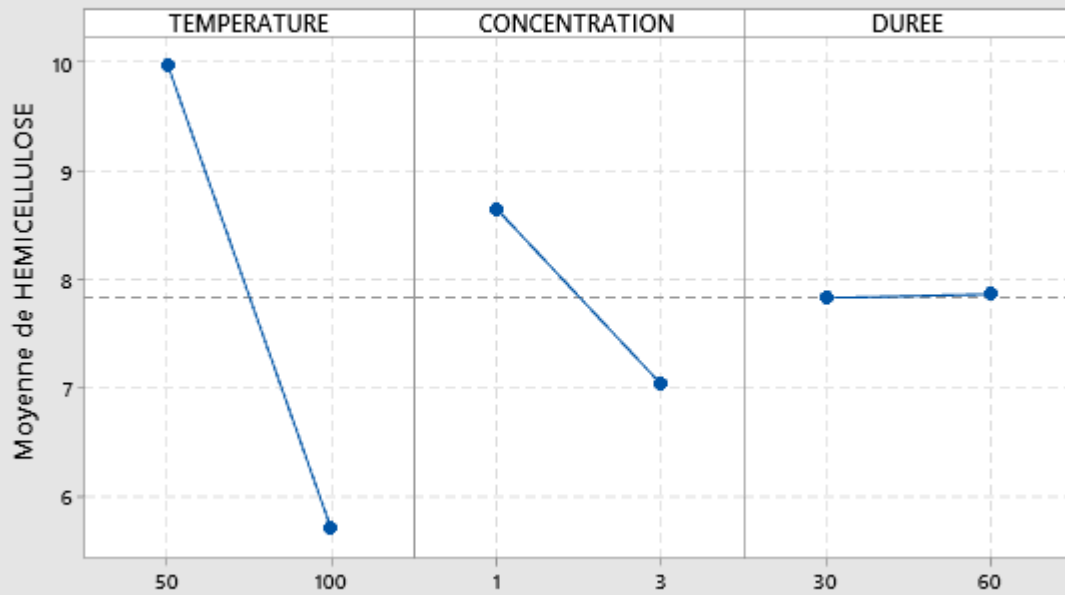
Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	46.1172	6.5882	*	*
Linear	3	41.9764	13.9921	*	*
TEMPERATURE	1	36.7267	36.7267	*	*
CONCENTRATION	1	5.2472	5.2472	*	*
TIME	1	0.0025	0.0025	*	*
2-Way Interactions	3	3.6805	1.2268	*	*
TEMPERATURE*CONCENTRATION	1	0.1797	0.1797	*	*
TEMPERATURE*TIME	1	2.5753	2.5753	*	*
CONCENTRATION*TIME	1	0.9255	0.9255	*	*
3-Way Interactions	1	0.4603	0.4603	*	*
TEMPERATURECONCENTRATIONTIME	1	0.4603	0.4603	*	*
Error	0	*	*		
Total	7	46.1172			

Figures

- **Figure S25. Factorial plot of hemicellulose content**

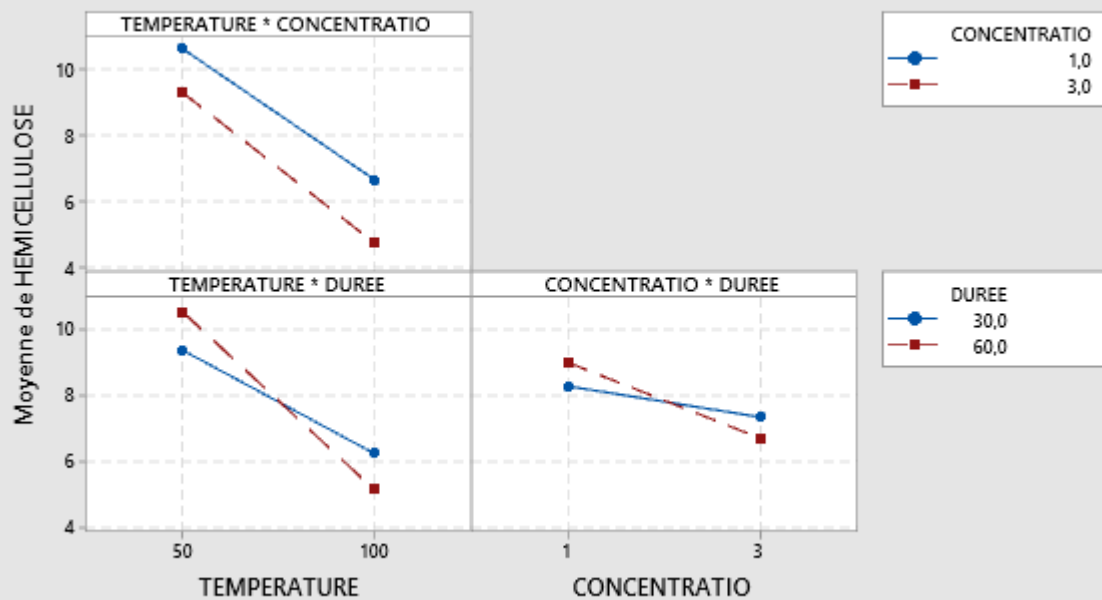


Graphique des effets principaux pour HEMICELLULOSE Moyennes ajustées



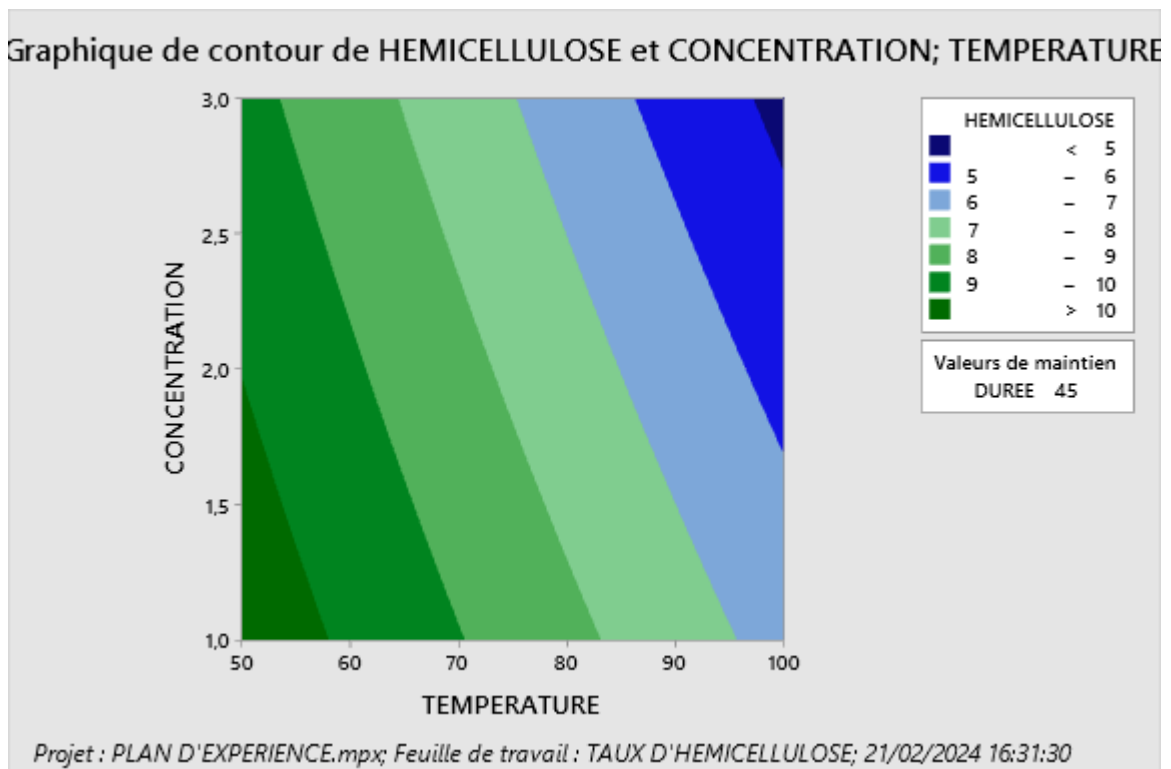
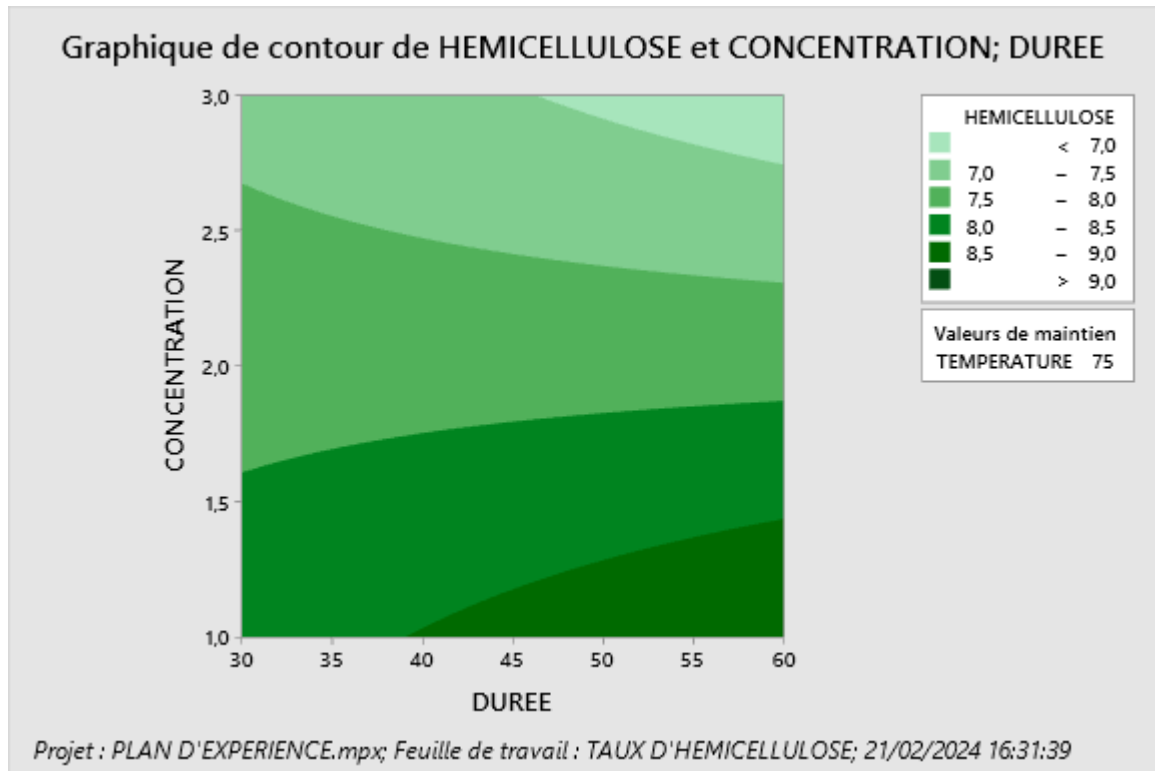
Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX D'HEMICELLULOSE; 21/02/2024 16:31:17

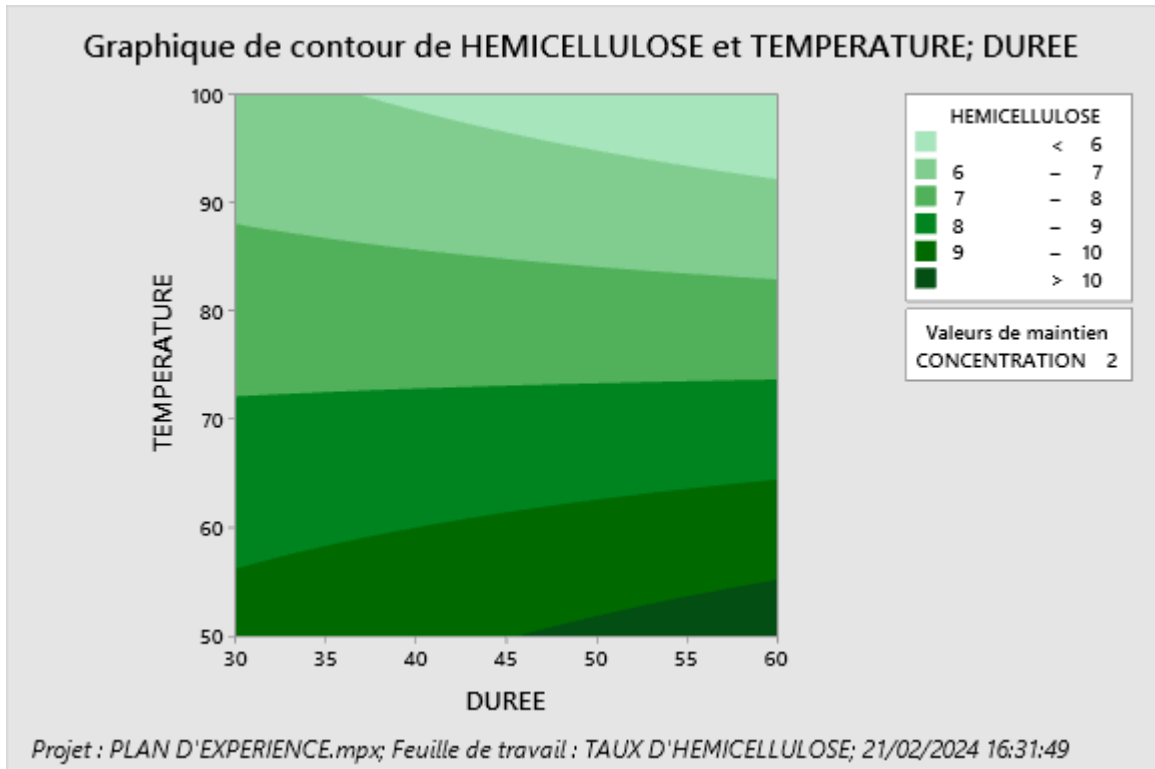
Diagramme des interactions pour HEMICELLULOSE Moyennes ajustées



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX D'HEMICELLULOSE; 21/02/2024 16:31:17

- **Figure S26. Contour plot of hemicellulose content**





- **Figure S27. Response surface plot of hemicellulose content**

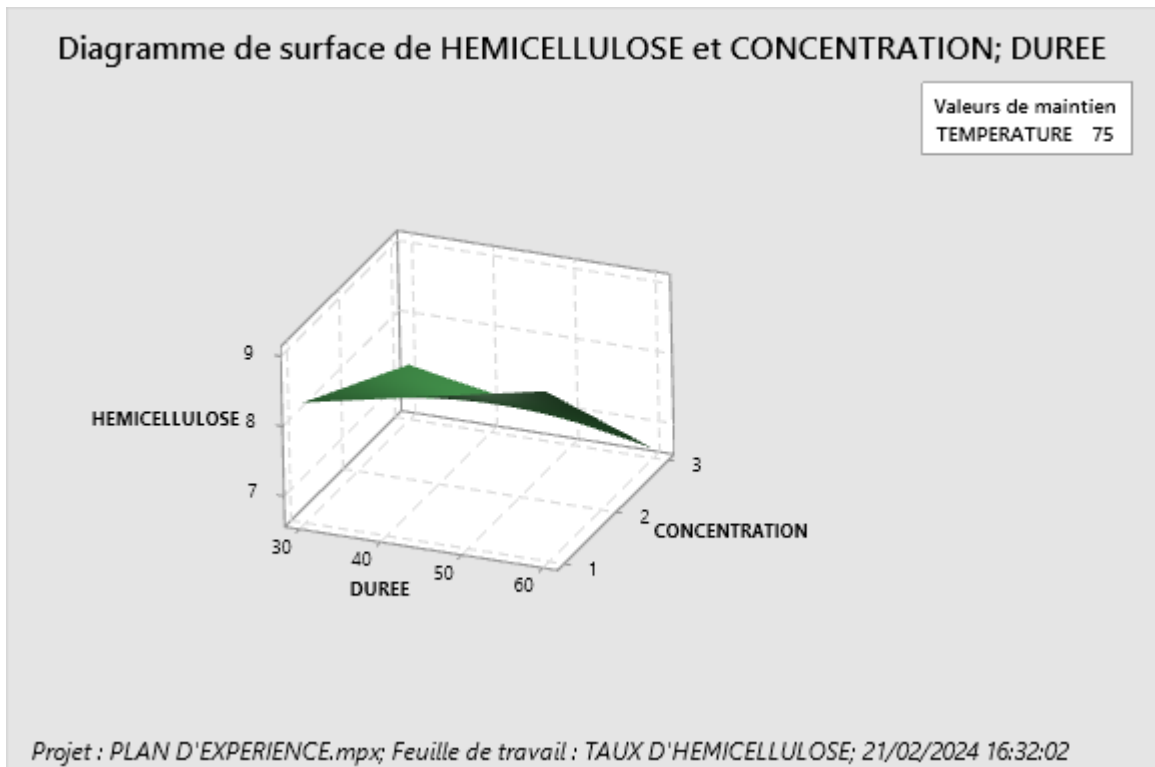
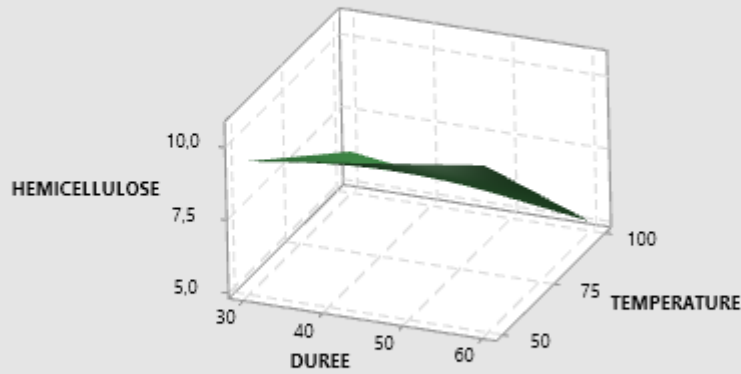


Diagramme de surface de HEMICELLULOSE et TEMPERATURE; DUREE

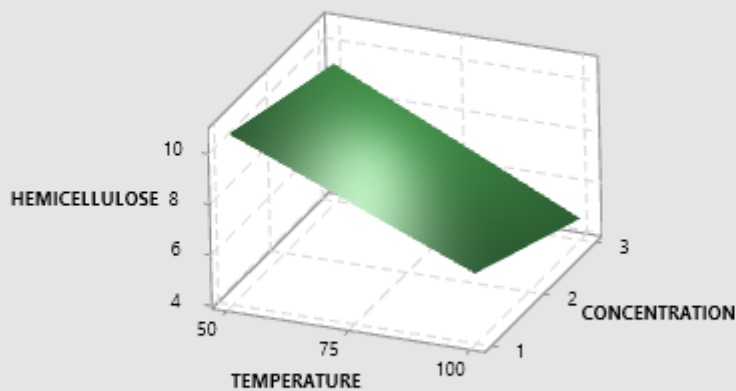
Valeurs de maintien
CONCENTRATION 2



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX D'HEMICELLULOSE; 21/02/2024 16:32:10

Diagramme de surface de HEMICELLULOSE et CONCENTRATION; TEMPERATURE

Valeurs de maintien
DUREE 45



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX D'HEMICELLULOSE; 21/02/2024 16:31:54

12. Cellulose content

This section presents the statistical analyses and graphical representations related to the cellulose content of the treated fibers.

Tables

- **Table S20. Factorial regression coefficients of cellulose content**

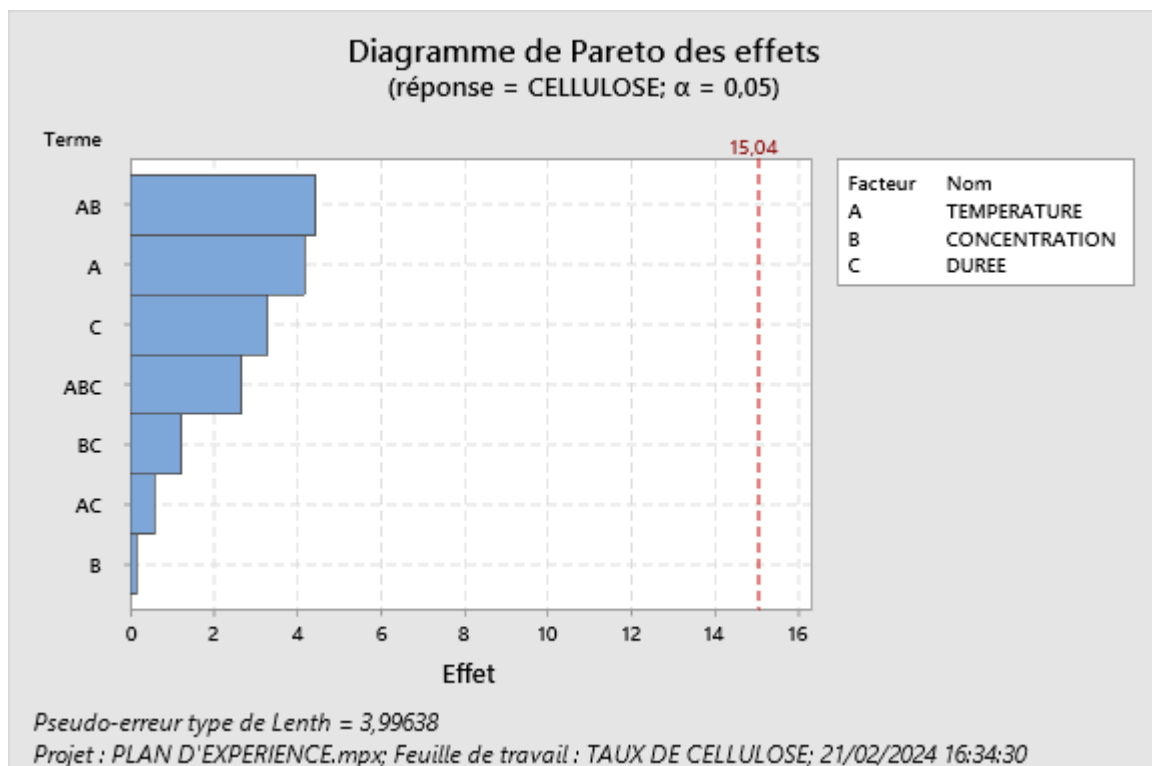
Term	Effect	Coef	SE Coef	T-Value	P-Value	VIF
Constant		69.12	*	*	*	
TEMPERATURE	4.185	2.093	*	*	*	1.00
CONCENTRATION	0.15075	0.07538	*	*	*	1.00
TIME	3.300	1.650	*	*	*	1.00
TEMPERATURE*CONCENTRATION	-4.430	-2.215	*	*	*	1.00
TEMPERATURE*TIME	0.5807	0.2904	*	*	*	1.00
CONCENTRATION*TIME	-1.2247	-0.6124	*	*	*	1.00
TEMPERATURECONCENTRATIONTIME	2.664	1.332	*	*	*	1.00

- **Table S21. Analysis of variance (ANOVA) of cellulose content**

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Model	7	113.980	16.2829	*	*
Linear	3	56.855	18.9516	*	*
TEMPERATURE	1	35.033	35.0326	*	*
CONCENTRATION	1	0.045	0.0455	*	*
TIME	1	21.777	21.7767	*	*
2-Way Interactions	3	42.929	14.3096	*	*
TEMPERATURE*CONCENTRATION	1	39.254	39.2542	*	*
TEMPERATURE*TIME	1	0.675	0.6745	*	*
CONCENTRATION*TIME	1	3.000	3.0000	*	*
3-Way Interactions	1	14.196	14.1965	*	*
TEMPERATURECONCENTRATIONTIME	1	14.196	14.1965	*	*
Error	0	*	*		
Total	7	113.980			

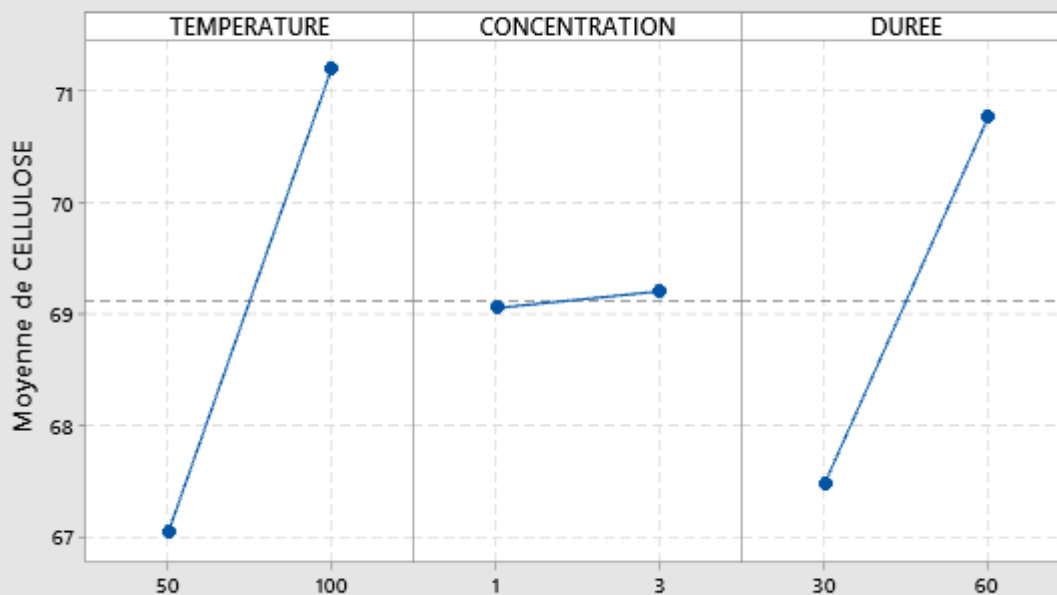
Figures

- **Figure S28. Factorial plot of cellulose content**



Graphique des effets principaux pour CELLULOSE

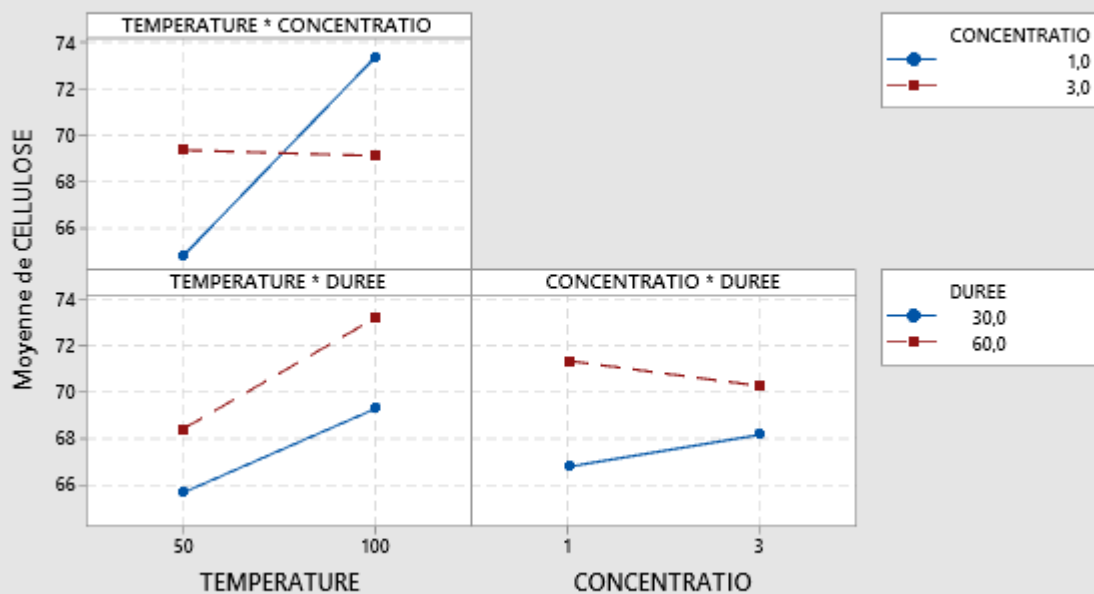
Moyennes ajustées



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE CELLULOSE; 21/02/2024 16:34:38

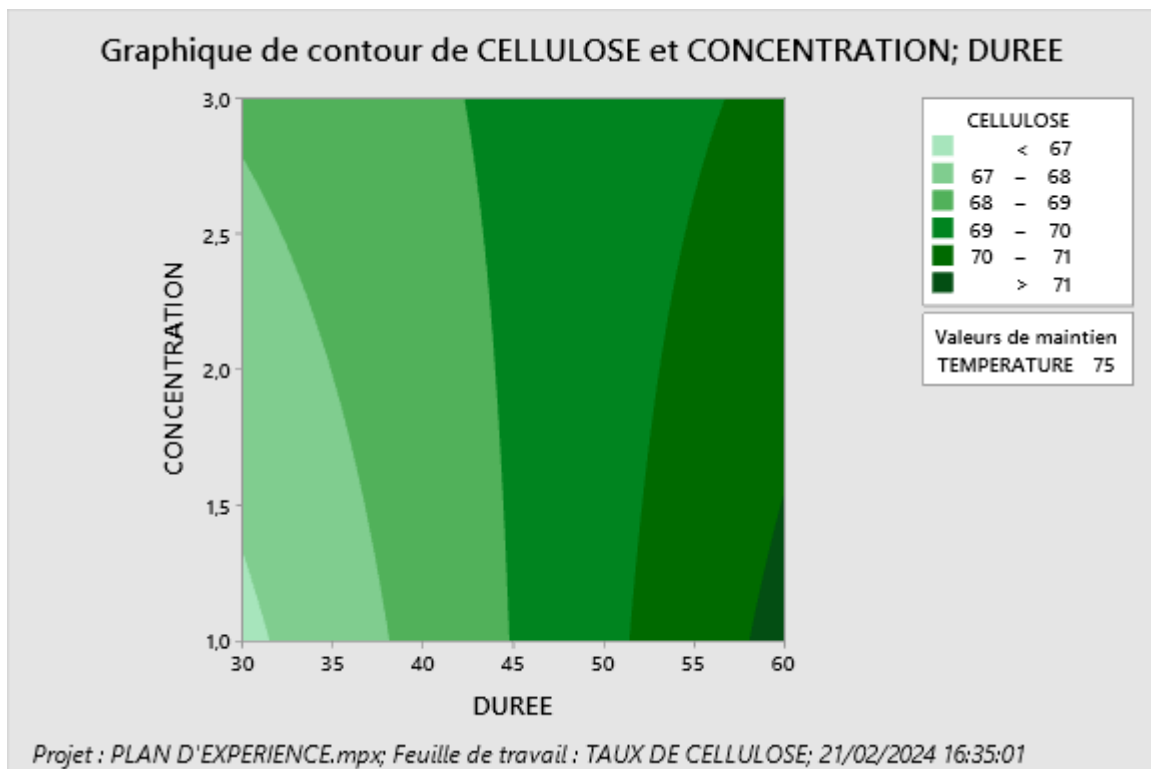
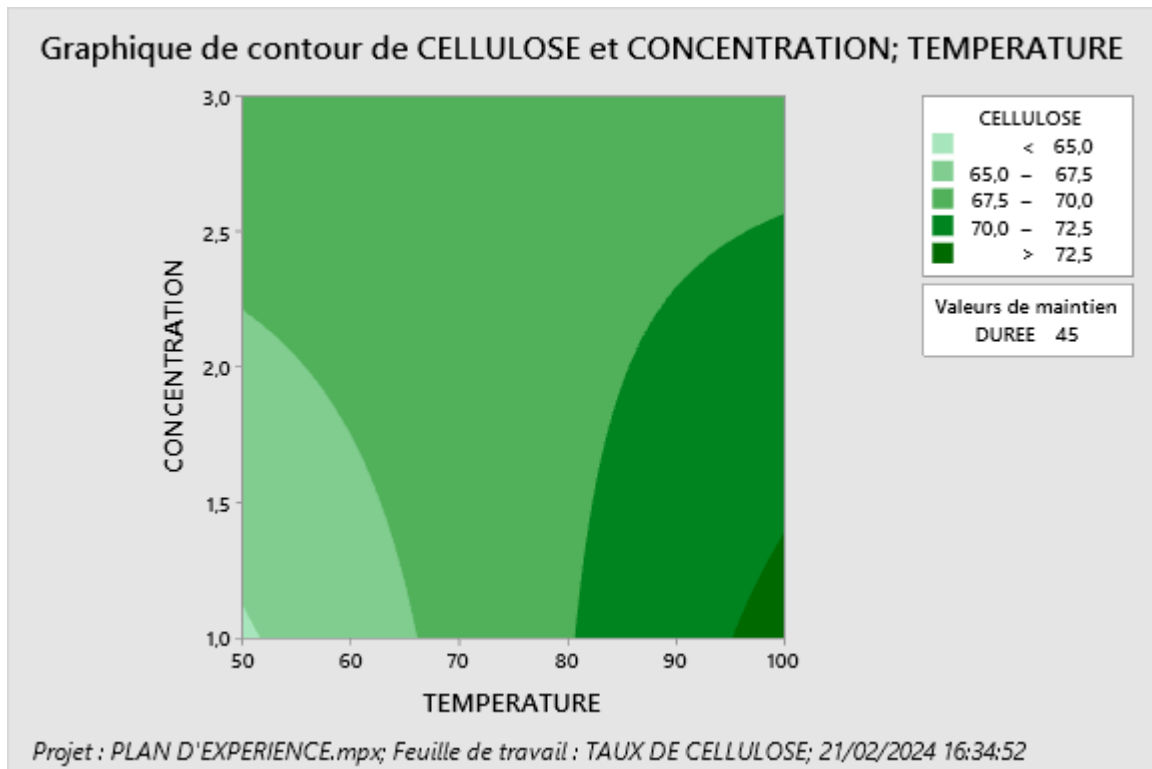
Diagramme des interactions pour CELLULOSE

Moyennes ajustées

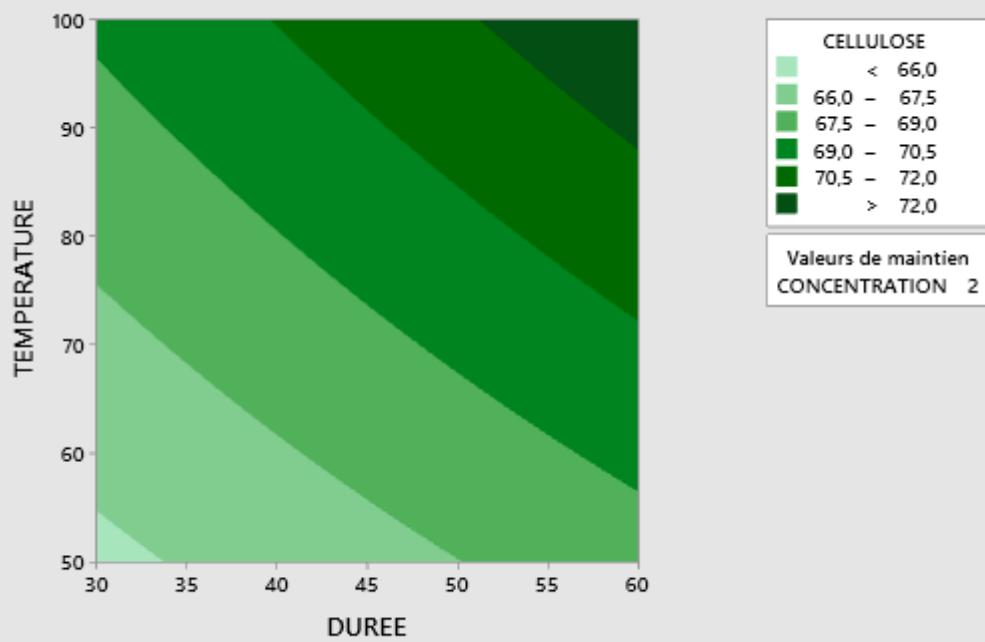


Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE CELLULOSE; 21/02/2024 16:34:38

- **Figure S29. Contour plot of cellulose content**



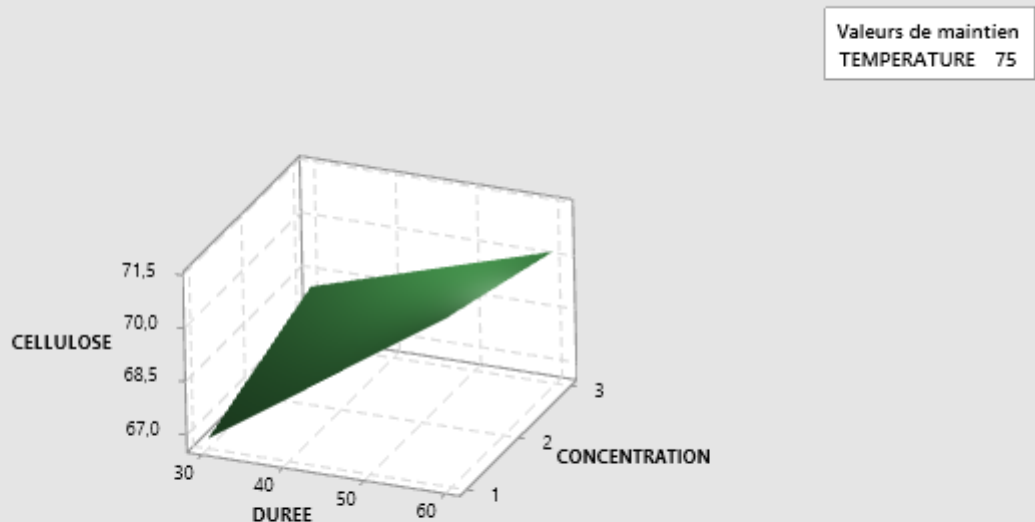
Graphique de contour de CELLULOSE et TEMPERATURE; DUREE



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE CELLULOSE; 21/02/2024 16:35:11

- Figure S30. Response surface plot of cellulose content

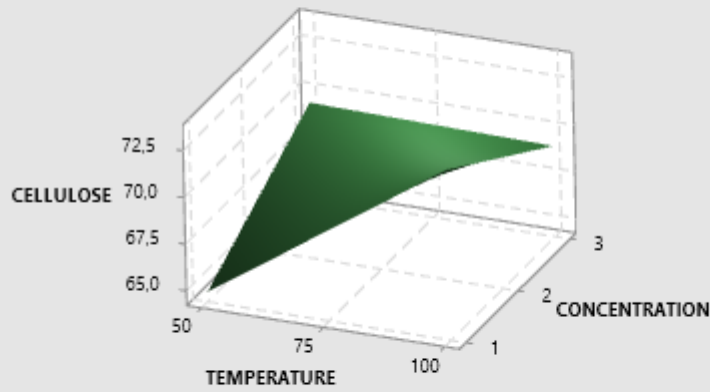
Diagramme de surface de CELLULOSE et CONCENTRATION; DUREE



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE CELLULOSE; 21/02/2024 16:35:24

Diagramme de surface de CELLULOSE et CONCENTRATION; TEMPERATURE

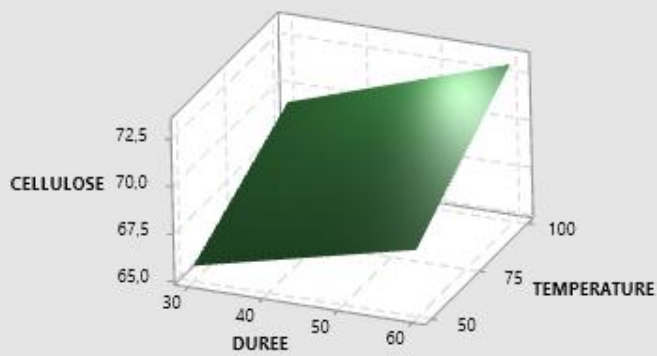
Valeurs de maintien
DUREE 45



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE CELLULOSE; 21/02/2024 16:35:16

Diagramme de surface de CELLULOSE et TEMPERATURE; DUREE

Valeurs de maintien
CONCENTRATION 2



Projet : PLAN D'EXPERIENCE.mpx; Feuille de travail : TAUX DE CELLULOSE; 21/02/2024 16:35:32